Name: ________________________ Class: ___________________ Date: __________ ID: A

GSE Algebra 2 practice exam

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Identify the degree of the monomial $-5r^3s^5$.

a. 5
b. 8
c. 3
d. –5

____ 2. Rewrite the polynomial $12x^2 + 6 - 7x^5 + 3x^3 + 7x^4 - 5x$ in standard form. Then, identify the leading coefficient, degree, and number of terms. Name the polynomial.

a. $-7x^5 + 7x^4 + 3x^3 + 12x^2 - 5x + 6$
leading coefficient: –7; degree: 5; number of terms: 6; name: quintic polynomial

b. $6 - 5x + 12x^2 + 7x^3 + 3x^4 - 7x^5$
leading coefficient: 6; degree: 0; number of terms: 6; name: quintic polynomial

c. $-7x^5 + 7x^4 + 12x^3 + 3x^2 - 5x + 6$
leading coefficient: –7; degree: 5; number of terms: 6; name: quintic polynomial

d. $6 - 5x + 12x^2 + 3x^3 + 7x^4 - 7x^5$
leading coefficient: 6; degree: 0; number of terms: 6; name: quintic polynomial

____ 3. Add. Write your answer in standard form.
$(5a^5 - a^4) + (a^5 + 7a^4 - 2)$

a. $6a^5 + 6a^4$
b. $6a^{10} + 6a^8 - 2$
c. $6a^5 + 6a^4 - 2$
d. $5a^5 + 7a^4 - 2$

____ 4. A florist delivers flowers to anywhere in town. d is the distance from the delivery address to the florist shop in miles. The cost to deliver flowers, based on the distance d, is given by $C(d) = 0.04d^3 - 0.65d^2 + 3.5d + 9$. Evaluate $C(d)$ for $d = 6$ and $d = 11$, and describe what the values of the function represent.

a. $C(6) = 15.24$; $C(11) = 22.09$.
$C(6)$ represents the cost, \$15.24, of delivering flowers to a destination that is 6 miles from the shop.
$C(11)$ represents the cost, \$22.09, of delivering flowers to a destination that is 11 miles from the shop.

b. $C(6) = 62.04$; $C(11) = 179.39$.
$C(6)$ represents the cost, \$62.04, of delivering flowers to a destination that is 6 miles from the shop.
$C(11)$ represents the cost, \$179.39, of delivering flowers to a destination that is 11 miles from the shop.

c. $C(6) = 23.43$; $C(11) = 49.62$.
$C(6)$ represents the cost, \$23.43, of delivering flowers to a destination that is 6 miles from the shop.
$C(11)$ represents the cost, \$49.62, of delivering flowers to a destination that is 11 miles from the shop.

d. $C(6) = 22.09$; $C(11) = 15.24$.
$C(6)$ represents the cost, \$22.09, of delivering flowers to a destination that is 6 miles from the shop.
$C(11)$ represents the cost, \$15.24, of delivering flowers to a destination that is 11 miles from the shop.

____ 5. Graph the polynomial function $f(x) = -x^4 + 3x^3 + 2x^2 - 5x - 4$ on a graphing calculator. Describe the graph, and identify the number of real zeros.

a. From left to right, the graph alternately increases and decreases, changing direction two times. It crosses the x-axis three times, so there appear to be three real zeros.
b. From left to right, the graph alternately increases and decreases, changing direction three times. It crosses the x-axis two times, so there appear to be two real zeros.
c. From left to right, the graph alternately increases and decreases, changing direction three times. It crosses the x-axis four times, so there appear to be four real zeros.
d. From left to right, the graph increases and then decreases. It crosses the x-axis twice, so there appear to be two real zeros.

____ 6. For $h(x) = 2x^2 + 6x - 9$ and $k(x) = 3x^2 - 8x + 8$, find $h(x) - 2k(x)$.

a. $-4x^2 - 22x + 25$
b. $-4x^2 + 22x - 25$
c. $-4x^2 + 14x - 17$
d. $-4x^2 - 14x + 17$

____ 7. Find the product $2cd^4(-4c^6d^5 - c^3d)$.

a. $2c^8d^{10} + 2c^5d^6$
b. $-8c^7d^9 - 2c^4d^5$
c. $-8c^6d^{20} - 2c^3d^4$
d. $-2c^7d^9 + c^4d^5$

____ 8. Find the product $(5x - 3)(x^3 - 5x + 2)$.

a. $5x^4 - 3x^3 + 25x^2 - 5x - 6$
b. $5x^3 - 28x^2 + 25x - 6$
c. $5x^4 - 3x^3 - 25x^2 + 25x - 6$
d. $5x^3 + 22x^2 - 5x - 6$

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____ 9. Ms. Ponce owns a company that makes specialized race car engines. From 1985 through 2005, the number of engines produced can be modeled by $N(x) = 6x^2 - 4x + 300$ where x is number of years since 1985. The average revenue per engine (in dollars) can be modeled by $R(x) = 30x^2 + 70x + 1{,}000$. Write a polynomial $T(x)$ that can be used to model Ms. Ponce's total revenue.

a. $36x^4 + 66x^2 + 1{,}300$
b. $180x^4 + 300x^3 + 14{,}720x^2 + 17{,}000x + 300{,}000$
c. $36x^4 + 39x^3 - 580x^2 + 9{,}700x + 15{,}300$
d. $180x^4 - 280x^2 + 300{,}000$

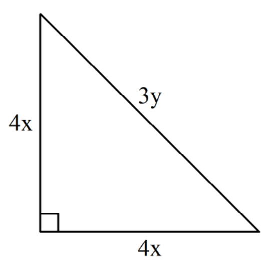
____ 10. Find the product $(x - 2y)^3$.

a. $x^3 - 6x^2y + 12xy^2 - 8y^3$
b. $x^3 + 8y^3$
c. $x^3 + 6x^2y + 12xy^2 + 8y^3$
d. $x^3 - 8y^3$

____ 11. Use Pascal's Triangle to expand the expression $(4x + 3)^4$.

a. $256x^4 + 576x^3 + 432x^2 + 108x + 81$
b. $256x^4 + 192x^3 + 144x^2 + 108x + 81$
c. $20736x^4 + 6912x^3 + 864x^2 + 48x + 3$
d. $256x^4 + 768x^3 + 864x^2 + 432x + 81$

____ 12. The right triangle shown is enlarged such that each side is multiplied by the value of the hypotenuse, $3y$. Find the expression that represents the perimeter of the enlarged triangle.



a. $9y^2 + 8xy$
b. $6y + 24xy$
c. $9y^2 + 24xy$
d. $6y^2 + 24xy$

____ 13. Use the Binomial Theorem to expand the binomial $(2x - 4y)^4$.

a. $16x^4 - 128x^3y + 384x^2y^2 - 512xy^3 + 256y^4$
b. $16x^4 + 256y^4$
c. $16x^4 - 256y^4$
d. $16x^4 + 128x^3y + 384x^2y^2 + 512xy^3 + 256y^4$

____ 14. Divide by using long division: $(5x + 6x^3 - 8) \div (x - 2)$.

a. $6x^2 - 12x + 29 - \frac{64}{(x-2)}$
b. $6x^2 + 12x + 29$
c. $6x^2 + 12x + 29 + \frac{50}{(x-2)}$
d. $6x^2 + 5 - \frac{8}{(x-2)}$

____ 15. Divide by using synthetic division.
$(x^2 - 9x + 10) \div (x - 2)$

a. $x - 11 + \frac{32}{x-2}$
b. $x - 9 + \frac{6}{x-2}$
c. $2x - 18 + \frac{10}{x-2}$
d. $x - 7 + \frac{-4}{x-2}$

____ 16. Use synthetic substitution to evaluate the polynomial $P(x) = x^3 - 4x^2 + 4x - 5$ for $x = 4$.

a. $P(4) = -149$
b. $P(4) = 11$
c. $P(4) = -53$
d. $P(4) = 149$

____ 17. Write an expression that represents the width of a rectangle with length $x + 5$ and area $x^3 + 12x^2 + 47x + 60$.

a. $x^3 + 7x^2 + 12x$
b. $x^2 + 17x - 38 - \frac{50}{x+5}$
c. $x^2 + 7x + 12$
d. $x^2 + 17x + 132 + \frac{720}{x+5}$

____ 18. Determine whether the binomial $(x - 4)$ is a factor of the polynomial $P(x) = 5x^3 - 20x^2 - 5x + 20$.

a. Cannot determine.
b. $(x - 4)$ is a factor of the polynomial $P(x) = 5x^3 - 20x^2 - 5x + 20$.
c. $(x - 4)$ is not a factor of the polynomial $P(x) = 5x^3 - 20x^2 - 5x + 20$.

____ 19. Factor $x^3 + 5x^2 - 9x - 45$.

a. $(x + 5)(x - 3)(x + 3)$
b. $(x - 5)(x^2 + 9)$
c. $(x + 5)(x^2 + 9)$
d. $(x - 5)(x - 3)(x + 3)$

____ 20. Factor the expression $81x^6 + 24x^3y^3$.

a. $3x^3(3x + 2y)(9x^2 - 6xy + 4y^2)$
b. $3x^3(3x + 2y)(9x^2 + 6xy + 4y^2)$
c. $3x^3(3x + 2y)^3$
d. $3x^3(27x^3 + 8y^3)$

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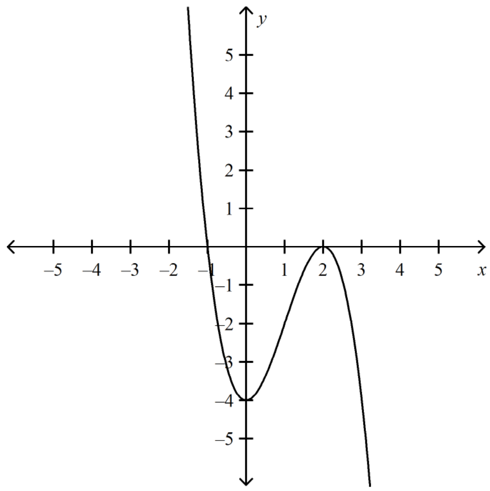
____ 21. Computer graphics programs often employ a method called *cubic splines regression* to smooth hand-drawn curves. This method involves splitting a hand-drawn curve into regions that can be modeled by cubic polynomials. A region of a hand-drawn curve is modeled by the function $f(x) = -x^3 + 3x^2 - 4$. Use the graph of $f(x) = -x^3 + 3x^2 - 4$ to identify the values of x for which $f(x) = 0$ and to factor $f(x)$.



a. $x = -1$; $x = 2$; $f(x) = (x+1)(x-2)^2$
b. $x = 1$; $x = -2$; $f(x) = -(x-1)^2(x+2)$
c. $x = -1$; $x = 2$; $f(x) = -(x+1)(x-2)^2$
d. $x = -1$; $x = 2$; $f(x) = -(x+1)^2(x-2)$

____ 22. Factor $(2x-1)^3 - 27$ as the difference of two cubes. Then, simplify each factor.

a. $(2x-4)(2x+2)^2$
b. $(2x-4)(4x^2 - 10x + 13)$
c. $(2x-4)(2x-3)(2x+4)$
d. $(2x-4)(4x^2 + 2x + 7)$

____ 23. Solve the polynomial equation $3x^5 + 6x^4 - 72x^3 = 0$ by factoring.

a. The roots are 0, –6, and 4.
b. The roots are –18 and 12.
c. The roots are 0, 6, and –4.
d. The roots are –6 and 4.

____ 24. Identify the roots of $-3x^3 - 21x^2 + 72x + 540 = 0$. State the multiplicity of each root.

a. $x + 5$ is a factor once, and $x - 6$ is a factor twice.
The root 5 has a multiplicity of 1, and the root –6 has a multiplicity of 2.
b. $x - 5$ is a factor once, and $x + 6$ is a factor twice.
The root 5 has a multiplicity of 1, and the root –6 has a multiplicity of 2.
c. $x + 5$ is a factor once, and $x - 6$ is a factor twice.
The root –5 has a multiplicity of 1, and the root 6 has a multiplicity of 2.
d. $x - 5$ is a factor once, and $x + 6$ is a factor twice.
The root –5 has a multiplicity of 1, and the root 6 has a multiplicity of 2.

____ 25. A jewelry box has a length that is 2 inches longer than the width and a height that is 1 inch smaller than the width. The volume of the box is 140 cubic inches. What is the width of the jewelry box?

a. 2 in.
b. 4 in.
c. 6 in.
d. 5 in.

____ 26. Identify all of the real roots of $4x^4 + 31x^3 - 4x^2 - 89x + 22 = 0$.

a. -2 and $\frac{1}{4}$
b. $\pm 1,\ \pm\frac{1}{2},\ \pm\frac{1}{4},\ \pm 2,\ \pm 11,\ \pm\frac{11}{2},\ \pm\frac{11}{4}$
c. $-2, \frac{1}{4}, 3 + 2\sqrt{5}, 3 - 2\sqrt{5}$
d. $-2, \frac{1}{4}, -3 + 2\sqrt{5}, -3 - 2\sqrt{5}$

____ 27. Write the simplest polynomial function with zeros 5, –4, and $\frac{1}{2}$.

a. $P(x) = x^3 - \frac{3}{2}x^2 - \frac{39}{2}x + 10$
b. $P(x) = x^4 - \frac{1}{2}x^3 - 11x^2 + \frac{1}{2}x + 10$
c. $P(x) = x^3 + 5x^2 - 4x + \frac{1}{2}$
d. $P(x) = x^3 + \frac{3}{2}x^2 - \frac{39}{2}x - 10$

____ 28. Solve $x^4 - 3x^3 - x^2 - 27x - 90 = 0$ by finding all roots.

a. The solutions are –3, –1, –27, and –90.
b. The solutions are –5, 2, $3i$, and $-3i$.
c. The solutions are 5 and –2.
d. The solutions are 5, –2, $3i$, and $-3i$.

____ 29. Write the simplest polynomial function with the zeros $2 - i$, $\sqrt{5}$, and –2.

a. $P(x) = x^6 - 4x^5 - 4x^4 + 36x^3 - 25x^2 - 80x + 100 = 0$
b. $P(x) = x^5 - 2x^4 - 8x^3 - 20x^2 - 65x - 50 = 0$
c. $P(x) = x^5 - 2x^4 - 8x^3 + 20x^2 + 15x - 50 = 0$
d. $P(x) = x^5 - 2x^4 - 10x^3 + 16x^2 + 25x - 30 = 0$

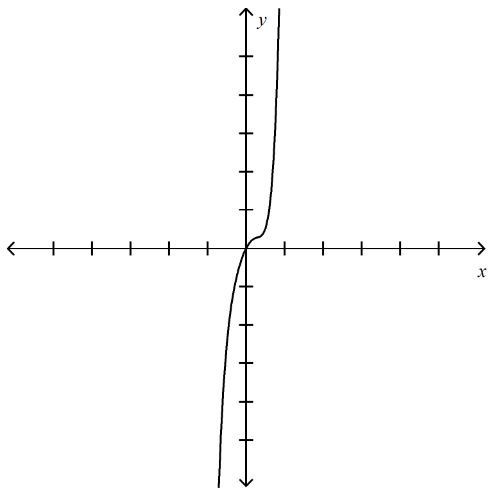
____ 30. What polynomial function has zeros 1, $1 + i$, and $1 - i$?

a. $P(x) = x^3 - x^2 + 2x + 1$
b. $P(x) = x^3 - 4x^2 + 3x - 1$
c. $P(x) = x^3 - 3x^2 + 4x - 2$
d. $P(x) = x^3 + 2x^2 - 3x - 3$

____ 31. Identify the leading coefficient, degree, and end behavior of the function $P(x) = -5x^4 - 6x^2 + 6$.

a. The leading coefficient is –5. The degree is 4.
As $x \to -\infty$, $P(x) \to +6$ and as $x \to +\infty$, $P(x) \to +6$
b. The leading coefficient is –5. The degree is 6.
As $x \to -\infty$, $P(x) \to -\infty$ and as $x \to +\infty$, $P(x) \to -\infty$
c. The leading coefficient is –5. The degree is 6.
As $x \to -\infty$, $P(x) \to +6$ and as $x \to +\infty$, $P(x) \to +6$
d. The leading coefficient is –5. The degree is 4.
As $x \to -\infty$, $P(x) \to -\infty$ and as $x \to +\infty$, $P(x) \to -\infty$

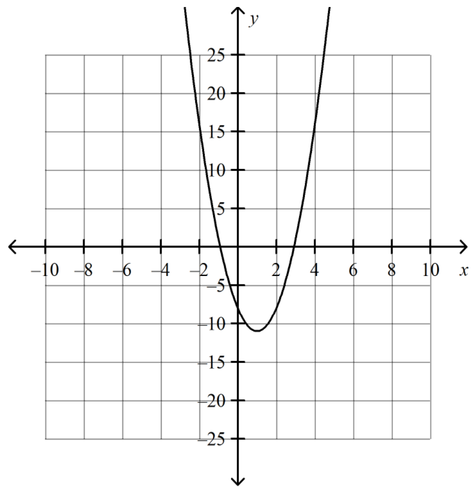
____ 32. Identify whether the function graphed has an odd or even degree and a positive or negative leading coefficient.



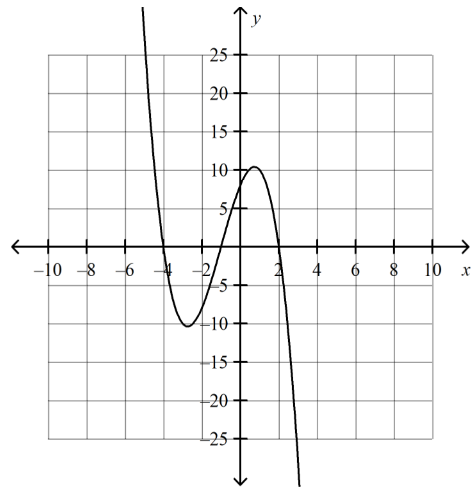
a. The degree is even, and the leading coefficient is negative.
b. The degree is odd, and the leading coefficient is negative.
c. The degree is odd, and the leading coefficient is positive.
d. The degree is even, and the leading coefficient is positive.

____ 33. Graph the function $f(x) = x^3 + 3x^2 - 6x - 8$.

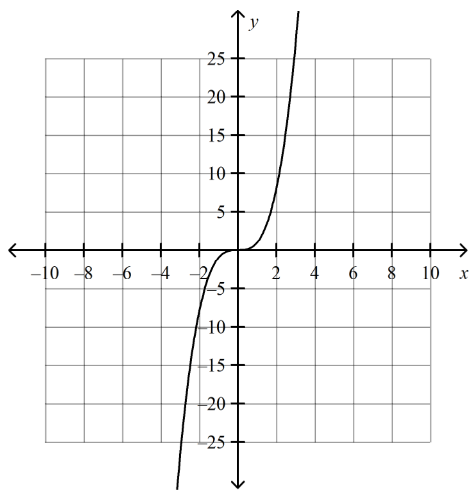
a.



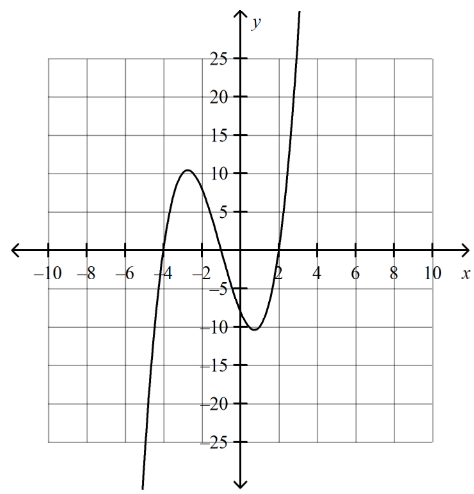
c.



b.



d.



____ 34. Graph $g(x) = 4x^3 - 24x + 9$ on a calculator, and estimate the local maxima and minima.

a. The local maximum is about 31.627417. The local minimum is about –13.627417.
b. The local maximum is about 13.627417. The local minimum is about –31.627417.
c. The local maximum is about 22.627417. The local minimum is about –22.627417.
d. The local maximum is about –13.627417. The local minimum is about 31.627417.

____ 35. Find the first 5 terms of the sequence with $a_1 = 6$ and $a_n = 2a_{n-1} - 1$ for $n \geq 2$.

a. 1, 2, 3, 4, 5
b. 6, 7, 8, 9, 10
c. 6, 12, 24, 48, 96
d. 6, 11, 21, 41, 81

____ 36. Find the first 5 terms of the sequence $a_n = 2^n - 5$.

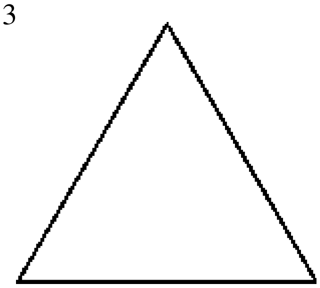
a. –3, –1, 3, 11, 27
b. 7, 9, 13, 21, 37
c. –4, –1, 4, 11, 20
d. –3, –1, 1, 3, 5

____ 37. Write a possible explicit rule for *n*th term of the sequence 23.1, 20.2, 17.3, 14.4, 11.5, 8.6, ...

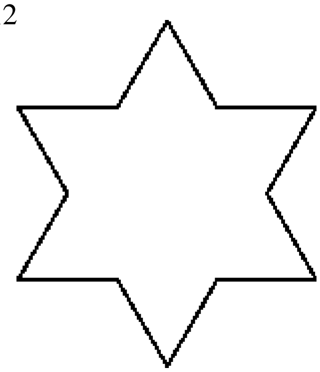
a. $a_n = 23.1(2.9n)$
b. $a_n = 26 - 2.9n$
c. $a_n = 23.1 - 2.9n$
d. $a_n = 23.1(2.9^n)$

____ 38. The Von Koch snowflake is a fractal made by taking an equilateral triangle, removing the middle third of each side, and then building an equilateral triangle where each side was removed. Let a_i = the number of sides of figure *i*. Find the number of sides in the next 2 iterations.

$a_1 = 3$



$a_2 = 12$



a. $a_3 = 60$ and $a_4 = 360$
b. $a_3 = 48$ and $a_4 = 192$
c. $a_3 = 21$ and $a_4 = 30$
d. $a_3 = 27$ and $a_4 = 48$

____ 39. Write the series $-\frac{1}{2}+\frac{1}{4}-\frac{1}{6}+\frac{1}{8}-\frac{1}{10}+\frac{1}{12}$ in summation notation.

a. $\sum_{k=1}^{6}(-1)^k\left(\frac{1}{2}\right)k$
b. $\sum_{k=1}^{6}(-1)^{k+1}\left(\frac{1}{2k}\right)$
c. $\sum_{k=1}^{6}(-1)^k\left(\frac{1}{2k}\right)$
d. $\sum_{k=1}^{6}(-1)^{k+1}\left(\frac{1}{2}\right)k$

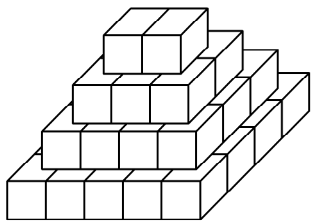
____ 40. Expand the series $\sum_{k=2}^{6}(-1)^k(7-k)k$ and evaluate.

a. 50
b. 56
c. 0
d. 6

____ 41. Evaluate the series $\sum_{k=1}^{22}k$.

a. 506
b. 23
c. 253
d. 22

____ 42. Alicia is building a block pyramid similar to the pyramid shown. The top level will always have two blocks. Alicia wants her pyramid to contain as many levels as possible. How many levels can her pyramid have if Alicia has 200 blocks?



a. 8 levels
b. 9 levels
c. 7 levels
d. 13 levels

____ 43. Determine whether the sequence 12, 40, 68, 96 could be geometric or arithmetic. If possible, find the common ratio or difference.

a. It could be arithmetic with $d = 28$.
b. It could be arithmetic with $d = -28$.
c. It could be geometric with $r = 28$.
d. It is neither.

____ 44. Find the 7th term of the geometric sequence –4, 12, –36, 108, –324,...

a. –2,916
b. 972
c. 8,748
d. –2,920

____ 45. Find the 7th term of the geometric sequence with $a_3 = 16$ and $a_5 = 64$.

a. 256
b. 384
c. 512
d. 112

____ 46. Find the geometric mean of $-\frac{1}{48}$ and $-\frac{1}{75}$.

a. $\pm\frac{16}{25}$
b. $\pm\frac{25}{16}$
c. $\pm\frac{1}{3600}$
d. $\pm\frac{1}{60}$

____ 47. Find the sum S_8 for the geometric series 6 + 0.6 + 0.06 + 0.006 + ...

a. 6.6666666
b. 0.1
c. –0.00000001
d. 3

____ 48. There are 256 players competing in a national chess championship tournament. The players compete until there is 1 winner. How many matches must be scheduled in order to complete the tournament?

a. 511 matches
b. 128 matches
c. 256 matches
d. 255 matches

____ 49. Find the first 3 terms of the geometric sequence with $a_6 = -128$ and $a_{11} = 4{,}096$.

a. –4, 16, –64
b. –4, 8, –16
c. 4, –16, 64
d. 4, –8, 16

____ 50. Given $f(x) = 2x^2 + 8x - 4$ and $g(x) = -5x + 6$, find $(f - g)(x)$.

a. $(f - g)(x) = 2x^2 + 13x - 10$
b. $(f - g)(x) = 7x^2 + 2x - 4$
c. $(f - g)(x) = 2x^2 + 3x + 2$
d. $(f - g)(x) = 7x^2 + 8x - 10$

____ 51. Given $f(x) = 4x^2 + 3x - 5$ and $g(x) = -2x + 12$, find $(fg)(x)$.

a. $(fg)(x) = -8x^3 - 6x^2 + 10x - 60$
b. $(fg)(x) = -8x^3 + 42x^2 + 46x - 60$
c. $(fg)(x) = -8x^3 - 6x^2 + 10x + 12$
d. $(fg)(x) = -8x^2 + 42x + 46x - 60$

____ 52. Given $f(x) = x^3$ and $g(x) = 4x + 3$, find $g(f(3))$.

a. $g(f(3)) = 108$
b. $g(f(3)) = 3,375$
c. $g(f(3)) = 111$
d. $g(f(3)) = 405$

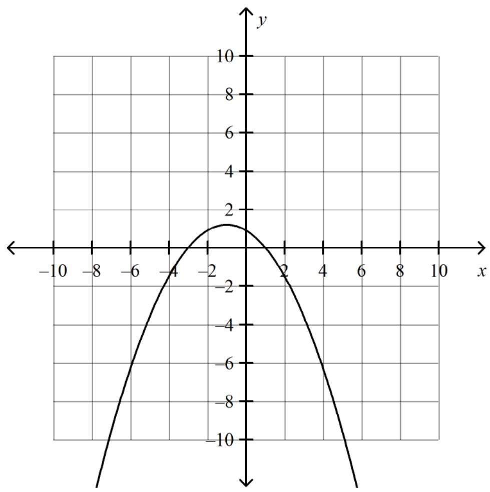
____ 53. Given $f(x) = \sqrt{x - 2}$ and $g(x) = \dfrac{6}{x - 3} + 1$, write the composite function $g(f(x))$ and state its domain.

a. $g(f(x)) = \sqrt{\dfrac{6}{x - 3} - 1}$, $x \geq 9$
b. $g(f(x)) = \dfrac{6}{\sqrt{x - 2} - 3} + 1$, $x \geq 2$
c. $g(f(x)) = \dfrac{6}{\sqrt{x - 2} - 3} + 1$, $x \geq 2, x \neq 11$
d. $g(f(x)) = \sqrt{\dfrac{6}{x - 3} - 1}$, $x \neq 3$

____ 54. The oven temperature for making breads and other baked goods at elevations over 3,500 feet, should be about 25 degrees Fahrenheit higher than the temperature used at sea level.
Write a composite function to represent the oven temperature at elevations over 3,500 feet in Celsius. The conversion from Fahrenheit to Celsius is $C(t) = \frac{5}{9}(t - 32)$, where t is the temperature in degrees Fahrenheit.

a. $C\big(F(t)\big) = \frac{9}{5}(t + 25) + 32$
b. $C\big(F(t)\big) = \frac{9}{5}t + 32$
c. $C\big(F(t)\big) = \frac{5}{9}(t - 7)$
d. $C\big(F(t)\big) = \frac{5}{9}(t - 32)$

____ 55. Use the horizontal-line test to determine whether the inverse of the relation is a function.



a. The inverse is a function because some horizontal lines pass through more than one point on the graph.
b. The inverse is not a function because no horizontal line passes through more than one point on the graph.
c. The inverse is not a function because some horizontal lines pass through more than one point on the graph.
d. The inverse is a function because no horizontal line passes through more than one point on the graph.

____ 56. Find the inverse of $f(x) = (3x - 24)^4$. Determine whether it is a function, and state its domain and range.

a. $y = \frac{1}{3}\sqrt[4]{x} + 8$;
The inverse is a function. The domain is $[0, \infty)$ and the range is $[8, \infty)$.

b. $y = \pm\frac{1}{3}\sqrt[4]{x} + 8$;
The inverse is not a function. The domain is $[0, \infty)$ and the range is $(-\infty, \infty)$.

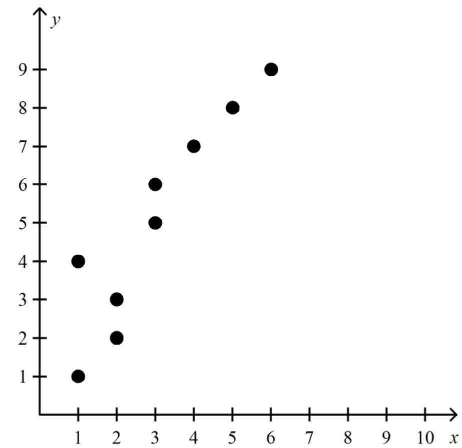
c. $y = \sqrt[4]{\frac{1}{3}x + 8}$;
The inverse is a function. The domain is $[-24, \infty)$ and the range is $[0, \infty)$.

d. $y = \pm\sqrt[4]{\frac{1}{3}x + 8}$;
The inverse is not a function. The domain is $[-24, \infty)$ and the range is $(-\infty, \infty)$.

____ 57. Determine by composition whether $f(x) = \frac{1}{5}x + 4$ and $g(x) = 5x - 20$ are inverses.

a. Yes, $f(g(x)) = g(f(x)) = x$.
b. No, $f(g(x)) \neq x$.

____ 58. Which of the following is true about the graphed relation?



a. Neither the relation nor its inverse is a function.
b. Both the relation and its inverse are functions.
c. The relation is a function, but its inverse is not a function.
d. The relation is not a function, but its inverse is a function.

GSE Algebra 2 practice exam
Answer Section

MULTIPLE CHOICE

1. ANS: B
Add the exponents of the variables. 3 + 5 = 8
The degree is 8.

	Feedback
A	Add the exponents of the variables.
B	Correct!
C	Add the exponents of the variables.
D	The degree of the monomial is the sum of the exponents of the variables.

PTS: 1 DIF: 1 REF: 15d6ed46-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.1 Identifying the Degree of a Monomial STA: MCC9-12.A.APR.1
LOC: MTH.C.10.05.08.006 TOP: 3-1 Polynomials
DOK: DOK 2

2. ANS: A
The standard form is written with the terms in order from highest to lowest degree.
In standard form, the degree of the first term is the degree of the polynomial.
The polynomial has 6 terms. It is a quintic polynomial.

	Feedback
A	Correct!
B	The standard form is written with the terms in order from highest to lowest degree.
C	Find the correct coefficient of the *x*-cubed term.
D	The standard form is written with the terms in order from highest to lowest degree.

PTS: 1 DIF: 2 REF: 15d92892-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.2 Classifying Polynomials STA: MCC9-12.A.APR.1
LOC: MTH.C.10.05.08.004 | MTH.C.10.05.08.006 | MTH.C.10.05.08.007
TOP: 3-1 Polynomials DOK: DOK 2

3. ANS: C

$(5a^5 - a^4) + (a^5 + 7a^4 - 2)$	
$= (5a^5 + 7a^4) + (-a^4 + a^5) + (-2)$	Identify like terms. Rearrange terms to get like terms together.
$= 6a^5 + 6a^4 - 2$	Combine like terms.

	Feedback
A	Check that you have included all the terms.
B	When adding polynomials, keep the same exponents.
C	Correct!
D	First, identify the like terms and rearrange these terms so they are together. Then, combine the like terms.

PTS: 1 DIF: 1 REF: 15db8aee-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.3 Adding and Subtracting Polynomials NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MCC9-12.A.APR.1 LOC: MTH.C.10.05.08.03.001
TOP: 3-1 Polynomials DOK: DOK 2

4. ANS: A

$C(6) = 0.04(6)^3 - 0.65(6)^2 + 3.5(6) + 9 = 15.24$

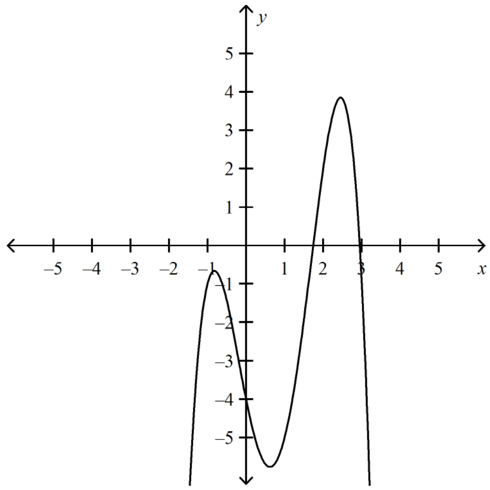
$C(11) = 0.04(11)^3 - 0.65(11)^2 + 3.5(11) + 9 = 22.09$

$C(6)$ represents the cost, $15.24, of delivering flowers to a destination that is 6 miles from the shop.
$C(11)$ represents the cost, $22.09, of delivering flowers to a destination that is 11 miles from the shop.

	Feedback
A	Correct!
B	You added all the terms. There is a minus sign before 0.65.
C	Square the number of miles before multiplying by 0.65.
D	You reversed the values of $C(6)$ and $C(11)$.

PTS: 1 DIF: 2 REF: 15dbb1fe-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.4 Application NAT: NT.CCSS.MTH.10.9-12.F.IF.2
STA: MCC8.MP.2 LOC: MTH.C.10.05.08.010 TOP: 3-1 Polynomials
DOK: DOK 3

5. ANS: B



From left to right, the graph alternately increases and decreases, changing direction three times. The graph crosses the *x*-axis two times, so there appear to be two real zeros.

	Feedback
A	How many times does the graph change direction? How many times does the graph cross the *x*-axis?
B	Correct!
C	How many times does the graph cross the *x*-axis?
D	How many times does the graph change direction? How many times does the graph cross the *x*-axis?

PTS: 1 DIF: 2 REF: 15dded4a-4683-11df-9c7d-001185f0d2ea
OBJ: 3-1.5 Graphing Higher-Degree Polynomials on a Calculator
NAT: NT.CCSS.MTH.10.9-12.F.IF.7 STA: MCC9-12.F.IF.7
LOC: MTH.C.10.07.07.03.001 TOP: 3-1 Polynomials
DOK: DOK 3

6. ANS: B

$h(x) - 2k(x)$

$= 2x^2 + 6x - 9 - 2(3x^2 - 8x + 8)$	Substitute the given values.
$= 2x^2 + 6x - 9 - 6x^2 + 16x - 16$	Distribute.
$= -4x^2 + 22x - 25$	Simplify.

	Feedback
A	Check for algebra mistakes. Multiplying by –2 changes the sign of every term in $k(x)$.
B	Correct!
C	Check for algebra mistakes. Multiply every term in $k(x)$ by –2.
D	Check for algebra mistakes. Multiply every term in $k(x)$ by –2.

PTS: 1 DIF: 3 REF: 15e04fa6-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.A.APR.1 STA: MCC9-12.A.APR.1
LOC: MTH.C.10.05.08.009 TOP: 3-1 Polynomials
DOK: DOK 3

7. ANS: B

Use the Distributive Property to multiply the monomial by each term inside the parentheses. Group terms to get like bases together, and then multiply.

	Feedback
A	Don't forget to multiply the coefficients for each term.
B	Correct!
C	When multiplying like bases, add the exponents.
D	Multiply the coefficients for each term; don't add.

PTS: 1 DIF: 1 REF: 15e076b6-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.1 Multiplying a Monomial and a Polynomial NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MCC9-12.A.APR.1 LOC: MTH.C.10.05.08.03.02.002
TOP: 3-2 Multiplying Polynomials DOK: DOK 3

8. ANS: C

$$(5x-3)(x^3-5x+2)$$

$= 5x(x^3-5x+2)-3(x^3-5x+2)$	Distribute $5x$ and -3.
$= 5x(x^3)+5x(-5x)+5x(2)-3(x^3)-3(-5x)-3(2)$	Distribute $5x$ and -3 again.
$= 5x^4-25x^2+10x-3x^3+15x-6$	Multiply.
$= 5x^4-3x^3-25x^2+25x-6$	Combine like terms.

	Feedback
A	Check the signs.
B	Combine only like terms.
C	Correct!
D	Combine only like terms.

PTS: 1 DIF: 2 REF: 15e2b202-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.2 Multiplying Polynomials NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MCC9-12.A.APR.1 LOC: MTH.C.10.05.08.03.02.002
TOP: 3-2 Multiplying Polynomials DOK: DOK 3

9. ANS: B

Total revenue is the product of the number of engines and the revenue per engine. $T(x) = N(x)R(x)$. Multiply the two polynomials using the distributive property.

$$\begin{array}{r} 6x^2 - 4x + 300 \\ \times\ 30x^2 + 70x + 1{,}000 \\ \hline 6{,}000x^2 - 4{,}000x + 300{,}000 \\ 420x^3 - 280x^2 + 21{,}000x \quad \\ 180x^4 - 120x^3 + 9{,}000x^2 \quad\quad \\ \hline 180x^4 + 300x^3 + 14{,}720x^2 + 17{,}000x + 300{,}000 \end{array}$$

	Feedback
A	First, multiply the coefficients. Then add the coefficients of like terms.
B	Correct!
C	First, multiply the coefficients. Then add the coefficients of like terms.
D	Multiply each of the terms in the first polynomial by each of the terms in the second polynomial.

PTS: 1 DIF: 2 REF: 15e5145e-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.3 Application NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MCC9-12.A.CED.1 LOC: MTH.C.10.05.08.03.02.001
TOP: 3-2 Multiplying Polynomials DOK: DOK 3

10. ANS: A
Write in expanded form.
$(x-2y)(x-2y)(x-2y)$

Multiply the last two binomial factors.
$(x-2y)(x^2-4xy+4y^2)$

Distribute the first term, distribute the second term, and combine like terms.
$x^3-6x^2y+12xy^2-8y^3$

	Feedback
A	Correct!
B	To find the product, write out the three binomial factors and multiply in two steps.
C	Remember that the second term is negative.
D	To find the product, write out the three binomial factors and multiply in two steps.

PTS: 1 DIF: 2 REF: 15e53b6e-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.4 Expanding a Power of a Binomial NAT: NT.CCSS.MTH.10.9-12.A.APR.1
STA: MCC9-12.A.APR.5 TOP: 3-2 Multiplying Polynomials
DOK: DOK 3

11. ANS: D
The coefficients for n = 4 or row 5 of Pascal's Triangle are 1, 4, 6, 4, and 1.
$(4x+3)^4$
$=\left[1(4x)^4(+3)^0\right]+\left[4(4x)^3(+3)^1\right]+\left[6(4x)^2(+3)^2\right]+\left[4(4x)^1(+3)^3\right]+\left[1(4x)^0(+3)^4\right]$
$=256x^4+768x^3+864x^2+432x+81$

	Feedback
A	Use row 5 from Pascal's Triangle.
B	Use the numbers from Pascal's Triangle as coefficients for each term.
C	The variable term and number term exponents must add to 4.
D	Correct!

PTS: 1 DIF: 2 REF: 15e776ba-4683-11df-9c7d-001185f0d2ea
OBJ: 3-2.5 Using Pascal's Triangle to Expand Binomial Expressions
NAT: NT.CCSS.MTH.10.9-12.A.APR.5 STA: MCC9-12.A.APR.5
TOP: 3-2 Multiplying Polynomials DOK: DOK 3

12. ANS: C

measure of leg 1 = $3y(4x) = 12xy$
measure of leg 2 = $3y(4x) = 12xy$
measure of hypotenuse = $3y(3y) = 9y^2$

$P = 9y^2 + 12xy + 12xy$
$P = 9y^2 + 24xy$

	Feedback
A	The perimeter is the sum of all the side lengths.
B	Multiply both side lengths and the hypotenuse by 3y.
C	Correct!
D	Check for algebra mistakes.

PTS: 1 DIF: 3 REF: 15e9d916-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.A.APR.1 STA: MCC9-12.A.APR.1
TOP: 3-2 Multiplying Polynomials DOK: DOK 3

13. ANS: A

Use Pascal's Triangle (or the combinations used to derive the triangle) to help determine the coefficients for each term in the expansion:

$_4C_0(2x)^4(-4y)^0 + {}_4C_1(2x)^3(-4y)^1 + {}_4C_2(2x)^2(-4y)^2 + {}_4C_3(2x)^1(-4y)^3 + {}_4C_4(2x)^0(-4y)^4$

Calculate the combinations:

$1 \times 16x^4 \times 1 + 4 \times 8x^3 \times (-4)y + 6 \times 4x^2 \times 16y^2 + 4 \times 2x \times (-64)y^3 + 1 \times 1 \times 256y^4$

Simplify:

$16x^4 - 128x^3y + 384x^2y^2 - 512xy^3 + 256y^4$

	Feedback
A	Correct!
B	Use Pascal's Triangle to help you with the expansion.
C	Use Pascal's Triangle to help you with the expansion.
D	Be careful to check the plus and minus signs.

PTS: 1 DIF: 2 REF: 17b39e16-4683-11df-9c7d-001185f0d2ea
OBJ: 3-3.1 Expanding Binomials NAT: NT.CCSS.MTH.10.9-12.A.APR.5
STA: MCC9-12.A.APR.5 LOC: MTH.C.10.05.08.03.01.01.001
TOP: 3-3 Binomial Distributions DOK: DOK 3

14. ANS: C
To divide, first write the dividend in standard form. Include missing terms with a coefficient of 0.
$6x^3 + 0x^2 + 5x - 8$

Then write out in long division form, and divide.

$$\begin{array}{r} 6x^2 + 12x + 29 \\ x-2 \overline{\big) 6x^3 + 0x^2 + 5x - 8} \\ \underline{-(6x^3 - 12x^2)} \\ 12x^2 + 5x \\ \underline{-(12x^2 - 24x)} \\ 29x - 8 \\ \underline{-(29x - 58)} \\ 50 \end{array}$$

Write out the answer with the remainder to get $6x^2 + 12x + 29 + \frac{50}{(x-2)}$.

	Feedback
A	Be careful when subtracting the terms.
B	Remember to include the remainder in the answer.
C	Correct!
D	Remember to divide by the "–2".

PTS: 1 DIF: 2 REF: 15ea0026-4683-11df-9c7d-001185f0d2ea
OBJ: 3-4.1 Using Long Division to Divide Polynomials NAT: NT.CCSS.MTH.10.9-12.A.APR.6
STA: MCC9-12.A.APR.6 LOC: MTH.C.10.05.08.03.03.002
TOP: 3-4 Dividing Polynomials DOK: DOK 3

15. ANS: D
For $(x-2)$, $a = 2$.

$$\begin{array}{r|rrr} 2 & 1 & -9 & 10 \\ & & 2 & -14 \\ \hline & 1 & -7 & -4 \end{array}$$

Write the coefficients of the expression.
Bring down the first coefficient. Multiply and add each column.

Write the remainder as a fraction to get $x - 7 + \frac{-4}{x-2}$.

	Feedback
A	The value 'a' occurs in the divisor as '$x - a$'.
B	Multiply each column by the value 'a'.
C	Begin synthetic division at the second coefficient.
D	Correct!

PTS: 1 DIF: 2 REF: 15ec3b72-4683-11df-9c7d-001185f0d2ea
OBJ: 3-4.2 Using Synthetic Division to Divide by a Linear Binomial
NAT: NT.CCSS.MTH.10.9-12.A.APR.6 STA: MCC8.MP.8 LOC: MTH.C.10.05.08.03.03.003
TOP: 3-4 Dividing Polynomials DOK: DOK 3

16. ANS: B

Write the coefficients of the dividend. Use $a = 4$.

$$\begin{array}{r|rrrr} 4 & 1 & -4 & 4 & -5 \\ & & 4 & 0 & 16 \\ \hline & 1 & 0 & 4 & \boxed{11} \end{array}$$

$P(4) = 11$

	Feedback
A	Add each column instead of subtracting.
B	Correct!
C	Bring down the first coefficient.
D	Write the coefficients in the synthetic division format. Some of them are negative numbers.

PTS: 1 DIF: 1 REF: 15ee9dce-4683-11df-9c7d-001185f0d2ea
OBJ: 3-4.3 Using Synthetic Substitution STA: MCC9-12.A.APR.2
LOC: MTH.C.10.07.07.02.002 TOP: 3-4 Dividing Polynomials
DOK: DOK 3

17. ANS: C

$\text{Width} = \dfrac{\text{Area}}{\text{Length}}$.

$\text{width} = \dfrac{x^3 + 12x^2 + 47x + 60}{x + 5}$ Substitute.

Use synthetic division.

$$\begin{array}{r|rrrr} -5 & 1 & 12 & 47 & 60 \\ & & -5 & -35 & -60 \\ \hline & 1 & 7 & 12 & \boxed{0} \end{array}$$

The width can be represented by $x^2 + 7x + 12$.

	Feedback
A	The degree of the polynomial quotient is always one less than the degree of the dividend.
B	Add each column instead of subtracting.
C	Correct!
D	When dividing by $x + 5$, divide by –5 in synthetic division.

PTS: 1 DIF: 2 REF: 15eec4de-4683-11df-9c7d-001185f0d2ea
OBJ: 3-4.4 Application NAT: NT.CCSS.MTH.10.9-12.A.APR.6
STA: MCC9-12.A.APR.6 LOC: MTH.C.10.05.08.03.03.003
TOP: 3-4 Dividing Polynomials DOK: DOK 3

18. ANS: B
Find $P(4)$ by synthetic substitution.

$$\begin{array}{r|rrrr} 4 & 5 & -20 & -5 & 20 \\ & & 20 & 0 & -20 \\ \hline & 5 & 0 & -5 & \boxed{0} \end{array}$$

Since $P(4) = 0$, $x - 4$ is a factor of the polynomial $P(x) = 5x^3 - 20x^2 - 5x + 20$.

	Feedback
A	$(x - r)$ is a factor of $P(x)$ if and only if $P(r) = 0$. Find $P(r)$ by synthetic substitution.
B	Correct!
C	$(x - r)$ is a factor of $P(x)$ if and only if $P(r) = 0$. Find $P(r)$ by synthetic substitution.

PTS: 1 DIF: 2 REF: 15f1002a-4683-11df-9c7d-001185f0d2ea
OBJ: 3-5.1 Determining Whether a Linear Binomial is a Factor
NAT: NT.CCSS.MTH.10.9-12.A.SSE.2 STA: MCC9-12.A.APR.2
LOC: MTH.C.10.07.07.02.002 TOP: 3-5 Factoring Polynomials
DOK: DOK 3

19. ANS: A

$(x^3 + 5x^2) + (-9x - 45)$	Group terms.
$= x^2(x + 5) - 9(x + 5)$	Factor common monomials from each group.
$= (x + 5)(x^2 - 9)$	Factor out the common binomial.
$= (x + 5)(x - 3)(x + 3)$	Factor the difference of squares.

	Feedback
A	Correct!
B	Watch your signs when factoring.
C	In the second group, factor out a negative number.
D	Watch your signs when factoring.

PTS: 1 DIF: 2 REF: 15f1273a-4683-11df-9c7d-001185f0d2ea
OBJ: 3-5.2 Factoring by Grouping NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MCC9-12.A.APR.3 LOC: MTH.C.10.05.08.03.04.011
TOP: 3-5 Factoring Polynomials DOK: DOK 3

20. ANS: A

Factor out the GCF.

$3x^3(27x^3 + 8y^3)$

Write as a sum of cubes.

$3x^3((3x)^3 + (2y)^3)$

Factor.

$3x^3(3x + 2y)((3x)^2 - 6xy + (2y)^2) = 3x^3(3x + 2y)(9x^2 - 6xy + 4y^2)$

	Feedback
A	Correct!
B	In a sum of cubes, the plus and minus signs alternate.
C	Check the formula for the sum of cubes.
D	After factoring out the GCF, see if the result can be factored further.

PTS: 1 DIF: 1 REF: 15f36286-4683-11df-9c7d-001185f0d2ea
OBJ: 3-5.3 Factoring the Sum or Difference of Two Cubes NAT: NT.CCSS.MTH.10.9-12.A.SSE.2
STA: MCC9-12.A.SSE.2 LOC: MTH.C.10.05.08.03.04.005
TOP: 3-5 Factoring Polynomials DOK: DOK 3

21. ANS: C

The graph indicates $f(x)$ has zeroes at $x = -1$ and $x = 2$. By the Factor Theorem, $(x+1)$ and $(x-2)$ are factors of $f(x)$. Use either root and synthetic division to factor the polynomial. Choose the root $x = -1$.

−1	−1	3	0	−4
		1	−4	4
	−1	4	−4	0

$f(x) = (x+1)(-x^2+4x-4)$ Write $f(x)$ as a product.

$f(x) = -(x+1)(x^2-4x+4)$ Factor out –1 from the quadratic.

$f(x) = -(x+1)(x-2)^2$ Factor the perfect-square quadratic.

	Feedback
A	The graph decreases as x increases. How is this represented in the function?
B	The Factor Theorem states that if r is a root of $f(x)$, then $x - r$, not $x + r$, is a factor of $f(x)$.
C	Correct!
D	After identifying the roots, use synthetic division to factor the polynomial.

PTS: 1 DIF: 2 REF: 15f5c4e2-4683-11df-9c7d-001185f0d2ea
OBJ: 3-5.4 Application
NAT: NT.CCSS.MTH.10.9-12.A.APR.2 | NT.CCSS.MTH.10.9-12.F.IF.8
STA: MCC9-12.A.APR.2 | MCC9-12.F.IF.8 LOC: MTH.C.10.05.08.03.04.002
TOP: 3-5 Factoring Polynomials DOK: DOK 4

22. ANS: D

$(2x-1)^3 - 3^3$ Rewrite the expression as a difference of cubes.

$= [(2x-1)-3][(2x-1)^2 + 3(2x-1) + 3^2]$ Use $a^3 - b^3 = (a-b)(a^2+ab+b^2)$.

$= (2x-4)(4x^2-4x+1+6x-3+9)$ Simplify.

$= (2x-4)(4x^2+2x+7)$ Combine like terms.

	Feedback
A	Use the formula for factoring a difference of two cubes.
B	Check your answer by multiplying the factors.
C	Use the formula for factoring a difference of two cubes.
D	Correct!

PTS: 1 DIF: 3 REF: 15f5ebf2-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.A.SSE.2 STA: MCC9-12.A.SSE.2
LOC: MTH.C.10.05.08.03.04.006 TOP: 3-5 Factoring Polynomials
DOK: DOK 3

23. ANS: A

$3x^5 + 6x^4 - 72x^3 = 0$	Factor out the GCF, $3x^3$.
$3x^3\left(x^2 + 2x - 24\right) = 0$	
$3x^3(x+6)(x-4) = 0$	Factor the quadratic.
$3x^3 = 0,\ x+6=0,\ x-4=0$	Set each factor equal to 0.
$x=0,\ x=-6,\ x=4$	Solve for x.

	Feedback
A	Correct!
B	Factor out the GCF first.
C	Set each factored expression equal to zero and solve.
D	Set the GCF equal to zero.

PTS: 1 DIF: 2 REF: 15f8273e-4683-11df-9c7d-001185f0d2ea
OBJ: 4-1.1 Using Factoring to Solve Polynomial Equations
NAT: NT.CCSS.MTH.10.9-12.A.APR.2 | NT.CCSS.MTH.10.9-12.A.APR.3
STA: MCC9-12.A.APR.3 LOC: MTH.C.10.06.05.01.003
TOP: 4-1 Finding Real Roots of Polynomial Equations DOK: DOK 3

24. ANS: B

$-3x^3 - 21x^2 + 72x + 540 = 0$

$-3x^3 - 21x^2 + 72x + 540 = -3(x-5)(x+6)(x+6)$

$x-5$ is a factor once, and $x+6$ is a factor twice.

The root 5 has a multiplicity of 1.

The root –6 has a multiplicity of 2.

	Feedback
A	You reversed the operation signs of the factors. Also, if $x - a$ is a factor of the equation, a is a root of the equation.
B	Correct!
C	You reversed the operation signs of the factors.
D	If $x - a$ is a factor of the equation, then a is a root of the equation.

PTS: 1 DIF: 2 REF: 15fa899a-4683-11df-9c7d-001185f0d2ea
OBJ: 4-1.2 Identifying Multiplicity NAT: NT.CCSS.MTH.10.9-12.A.APR.3
STA: MCC9-12.A.APR.2 TOP: 4-1 Finding Real Roots of Polynomial Equations
DOK: DOK 3

25. ANS: D

Let x be the width in inches. The length is $x+2$, and the height is $x-1$.

Step 1 Find an equation.

$x(x+2)(x-1) = 140$	Volume is the product of the length, width, and height.
$x^3+x^2-2x = 140$	Multiply the left side.
$x^3+x^2-2x-140=0$	Set the equation equal to 0.

Step 2 Factor the equation, if possible.

Factors of –140: ±1, ±2, ±4, ±5, ±7, ±10, ±14, ±20, ±28, ±35, ±120, ±140. Rational Root Theorem

Use synthetic substitution to test the positive roots (length can't be negative) to find one that actually is a root.

$(x-5)(x^2+6x+28)=0$	The synthetic substitution of 5 results in a remainder of 0. 5 is a root.
$x=\dfrac{-6\pm\sqrt{36-4(1)(28)}}{2(1)}=\dfrac{-6\pm\sqrt{-76}}{2}$	Use the Quadratic Formula to factor $x^2+6x+28$. The roots are complex.
Width = 5 in.	Width must be a positive real number.

	Feedback
A	Remember to subtract 140 from both sides before finding a root.
B	Be careful using synthetic substitution.
C	6 is not a possible root.
D	Correct!

PTS: 1 DIF: 2 REF: 15fab0aa-4683-11df-9c7d-001185f0d2ea
OBJ: 4-1.3 Application NAT: NT.CCSS.MTH.10.9-12.A.APR.3
STA: MCC9-12.A.CED.3 LOC: MTH.C.10.06.05.01.005 | MTH.C.10.06.05.005
TOP: 4-1 Finding Real Roots of Polynomial Equations DOK: DOK 4

26. ANS: D

The possible rational roots are ± 1, $\pm\frac{1}{2}$, $\pm\frac{1}{4}$, ± 2, ± 11, $\pm\frac{11}{2}$, $\pm\frac{11}{4}$.

Test –2.

–2	4	31	–4	–89	22
		–8	–46	100	–22
	4	23	–50	11	0

The remainder is 0, so –2 is a root.

Now test $\frac{1}{4}$.

$\frac{1}{4}$	4	23	–50	11
		1	6	–11
	4	24	–44	0

The remainder is 0, so $\frac{1}{4}$ is a root.

The polynomial factors to $(x+2)(x-\frac{1}{4})(4x^2+24x-44)$.

To find the remaining roots, solve $4x^2+24x-44=0$.

Factor out the common factor to get $4(x^2+6x-11)=0$.

Use the quadratic formula to find the irrational roots.

$$x=\frac{-6\pm\sqrt{36+44}}{2}=-3\pm 2\sqrt{5}$$

The fully factored equation is $(x+2)(4x-1)(x-(-3+2\sqrt{5}))(x-(-3-2\sqrt{5}))$.

The roots are -2, $\frac{1}{4}$, $(-3+2\sqrt{5})$, $(-3-2\sqrt{5})$.

	Feedback
A	These are the two rational roots. There are also irrational roots.
B	These are the possible rational roots. Use these to find the rational roots.
C	Be careful when finding the irrational roots.
D	Correct!

PTS: 1 DIF: 2 REF: 15fcebf6-4683-11df-9c7d-001185f0d2ea
OBJ: 4-1.4 Identifying All of the Real Roots of a Polynomial Equation
NAT: NT.CCSS.MTH.10.9-12.A.APR.3 STA: MCC9-12.A.APR.2
LOC: MTH.C.10.06.05.005 | MTH.C.10.06.05.006
TOP: 4-1 Finding Real Roots of Polynomial Equations DOK: DOK 3

27. ANS: A

$P(x) = 0$

$P(x) = (x - 5)(x + 4)(x - \frac{1}{2})$	If r is a zero of $P(x)$, then $x - r$ is a factor of $P(x)$.
$P(x) = (x^2 - x - 20)(x - \frac{1}{2})$	Multiply the first two binomials.
$P(x) = x^3 - \frac{3}{2}x^2 - \frac{39}{2}x + 10$	Multiply the trinomial by the binomial.

	Feedback
A	Correct!
B	The simplest polynomial with zeros $r1$, $r2$, and $r3$ is $(x - r1)(x - r2)(x - r3)$.
C	If r is a zero of $P(x)$, then $(x - r)$ is a factor of $P(x)$.
D	If r is a zero of $P(x)$, then $(x - r)$, not $(x + r)$, is a factor of $P(x)$.

PTS: 1 DIF: 2 REF: 15ff4e52-4683-11df-9c7d-001185f0d2ea
OBJ: 4-2.1 Writing Polynomial Functions Given Zeros STA: MCC9-12.A.CED.1
TOP: 4-2 Fundamental Theorem of Algebra DOK: DOK 3

28. ANS: D

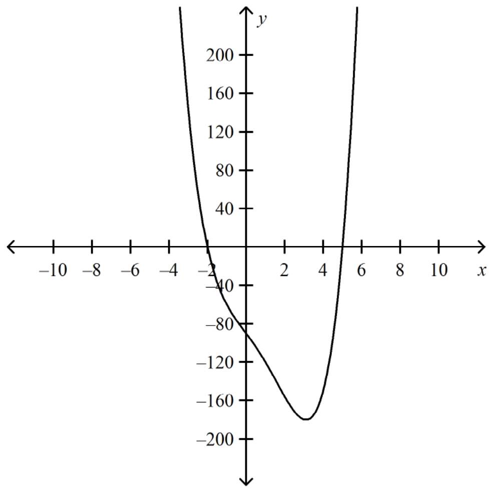
The polynomial is of degree 4, so there are four roots for the equation.

Step 1: Identify the possible rational roots by using the Rational Root Theorem.

$$\frac{\pm1, \pm2, \pm3, \pm5, \pm6, \pm9, \pm10, \pm15, \pm18 \pm 30, \pm45, \pm90}{\pm1}$$

$p = -90$ and $q = 1$

Step 2: Graph $x^4 - 3x^3 - x^2 - 27x - 90 = 0$ to find the locations of the real roots.



The real roots are at or near 5 and -2.

Step 3: Test the possible real roots.

Test the possible root of 5:	Test the possible root of –2:
$\underline{5}\vert$ 1 –3 –1 –27 –90	$\underline{-2}\vert$ 1 –3 –1 –27 –90
5 10 45 90	–2 10 –18 90
1 2 9 18 0	1 –5 9 –45 0

The polynomial factors into $(x-5)(x+2)(x^2+9) = 0$.

Step 4: Solve $x^2 + 9 = 0$ to find the remaining roots.

$x^2 + 9 = 0$

$x^2 = -9$

$x = \pm 3i$

The fully factored equation is $(x-5)(x+2)(x+3i)(x-3i) = 0$.

The solutions are 5, -2, $-3i$, and $3i$.

	Feedback
A	Graph the equation to find the locations of the real roots.
B	Set each factored expression equal to zero and solve!
C	The polynomial is of degree 4, so there are 4 roots.
D	Correct!

PTS: 1 DIF: 2 REF: 15ff7562-4683-11df-9c7d-001185f0d2ea
OBJ: 4-2.2 Finding All Roots of a Polynomial Equation
NAT: NT.CCSS.MTH.10.9-12.N.CN.9 | NT.CCSS.MTH.10.9-12.A.APR.2
STA: MCC9-12.N.CN.9 LOC: MTH.C.10.06.05.007 | MTH.C.10.06.05.008
TOP: 4-2 Fundamental Theorem of Algebra DOK: DOK 3

29. ANS: C

There are five roots: $2-i$, $2+i$, $\sqrt{5}$, $-\sqrt{5}$, and -2. (By the Irrational Root Theorem and Complex Conjugate Root Theorem, irrational and complex roots come in conjugate pairs.) Since it has 5 roots, the polynomial must have degree 5.

Write the equation in factored form, and then multiply to get standard form.

$P(x) = 0$

$(x-(2-i))(x-(2+i))(x-\sqrt{5})(x-(-\sqrt{5}))(x-(-2)) = 0$

$(x^2-4x+5)(x^2-5)(x+2) = 0$

$(x^4-4x^3+20x-25)(x+2) = 0$

$P(x) = x^5-2x^4-8x^3+20x^2+15x-50 = 0$

	Feedback
A	Only the irrational roots and the complex roots come in conjugate pairs. There are five roots in total.
B	$-4x(-5) = 20x$
C	Correct!
D	i squared is equal to –1, so the opposite is equal to 1.

PTS: 1 DIF: 2 REF: 1601b0ae-4683-11df-9c7d-001185f0d2ea
OBJ: 4-2.3 Writing a Polynomial Function with Complex Zeros
NAT: NT.CCSS.MTH.10.9-12.N.CN.9 | NT.CCSS.MTH.10.9-12.A.APR.2
STA: MCC9-12.N.CN.9 | MCC9-12.N.CN.8 LOC: MTH.C.10.06.05.008
TOP: 4-2 Fundamental Theorem of Algebra DOK: DOK 3

30. ANS: C

$P(x) = 0$	
$(x-1)[x-(1+i)][x-(1-i)] = 0$	If r is a root of $P(x)$, then $x-r$ is a factor of $P(x)$.
$(x-1)(x-1-i)(x-1+i) = 0$	Distribute.
$(x-1)(x^2-x+xi-x+1-i-ix+i+1) = 0$	Multiply the trinomials. Use $-i^2 = 1$.
$(x-1)(x^2-2x+2) = 0$	Combine like terms.
$x^3-2x^2+2x-x^2+2x-2 = 0$	Multiply the binomial and trinomial.
$x^3-3x^2+4x-2 = 0$	Combine like terms.

	Feedback
A	If r is a root of $P(x)$, then $(x - r)$ is a factor of $P(x)$.
B	If r is a root of $P(x)$, then $(x - r)$ is a factor of $P(x)$.
C	Correct!
D	First, multiply the factors. Then, combine like terms to get a polynomial function.

PTS: 1 DIF: 3 REF: 16043a1a-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.N.CN.9 | NT.CCSS.MTH.10.9-12.A.APR.2
STA: MCC9-12.N.CN.8 LOC: MTH.C.10.06.05.007
TOP: 4-2 Fundamental Theorem of Algebra DOK: DOK 4

31. ANS: D

The leading coefficient is –5, which is negative. The degree is 4, which is even.
So, as $x \to -\infty$, $P(x) \to -\infty$ and as $x \to +\infty$, $P(x) \to -\infty$.

	Feedback
A	For polynomials, the function always approaches positive infinity or negative infinity as *x* approaches positive infinity or negative infinity.
B	The degree is the greatest exponent.
C	The degree is the greatest exponent.
D	Correct!

PTS: 1 DIF: 1 REF: 16067566-4683-11df-9c7d-001185f0d2ea
OBJ: 4-3.1 Determining End Behavior of Polynomial Functions
STA: MCC9-12.F.IF.4 LOC: MTH.C.10.07.07.03.009
TOP: 4-3 Investigating Graphs of Polynomial Functions DOK: DOK 2

32. ANS: C
As $x \to -\infty$, $P(x) \to -\infty$ and as $x \to \infty$, $P(x) \to \infty$.
$P(x)$ is of odd degree with a positive leading coefficient.

	Feedback
A	The degree is even if the curve approaches the same *y*-direction as *x* approaches positive or negative infinity, and is odd if the curve increases and decreases in opposite directions. The leading coefficient is positive if the graph increases as *x* increases and negative if the graph decreases as *x* increases.
B	The leading coefficient is positive if the graph increases as *x* increases and negative if the graph decreases as *x* increases.
C	Correct!
D	The degree is even if the curve approaches the same *y*-direction as *x* approaches positive or negative infinity, and is odd if the curve increases and decreases in opposite directions.

PTS: 1 DIF: 1 REF: 1608d7c2-4683-11df-9c7d-001185f0d2ea
OBJ: 4-3.2 Using Graphs to Analyze Polynomial Functions NAT: NT.CCSS.MTH.10.9-12.F.IF.7.c
STA: MCC9-12.F.IF.4 LOC: MTH.C.10.07.07.003 | MTH.C.10.07.07.005
TOP: 4-3 Investigating Graphs of Polynomial Functions DOK: DOK 2

33. ANS: D

Step 1: Identify the possible rational roots by using the Rational Root Theorem. $p = -8$ and $q = 1$, so roots are positive and negative values in multiples of 2 from 1 to 8.

Step 2: Test possible rational zeros until a zero is identified.

Test $x = 1$.	Test $x = -1$.

1 | 1 3 −6 −8
      1 4 −2
1 4 −2 −10
	−1 | 1 3 −6 −8
	      −1 −2 8
	1 2 −8 0

$x = -1$ is a zero, and $f(x) = (x+1)(x^2 + 2x - 8)$.

Step 3: Factor: $f(x) = (x+1)(x-2)(x+4)$.
The zeros are –1, 2, and –4.

Step 4: Plot other points as guidelines.
$f(0) = -8$ so the y-intercept is -8. Plot points between the zeros.
$f(1) = -10$ and $f(-3) = 10$

Step 5: Identify end behavior.
The degree is odd and the leading coefficient is positive, so as $x \to -\infty$, $P(x) \to -\infty$ and as $x \to +\infty$, $P(x) \to +\infty$.

Step 6: Sketch the graph by using all of the information about $f(x)$.

	Feedback
A	The function is cubic, so should have 3 roots.
B	The leading coefficient is positive, so x should go to negative infinity as $P(x)$ goes to negative infinity.
C	The y-intercept should be the same as the last term in the equation.
D	Correct!

PTS: 1 DIF: 2 REF: 1608fed2-4683-11df-9c7d-001185f0d2ea
OBJ: 4-3.3 Graphing Polynomial Functions
NAT: NT.CCSS.MTH.10.9-12.A.APR.3 | NT.CCSS.MTH.10.9-12.F.IF.7.c
STA: MCC9-12.A.APR.3 LOC: MTH.C.10.07.07.03.001
TOP: 4-3 Investigating Graphs of Polynomial Functions DOK: DOK 3

34. ANS: A

Step 1 Graph $g(x)$ on a calculator.
The graph appears to have one local maximum and one local minimum.

Step 2 Use the maximum feature of your graphing calculator to estimate the local maximum.
The local maximum is about 31.627417.

Step 3 Use the minimum feature of your graphing calculator to estimate the local minimum.
The local minimum is about –13.627417.

	Feedback
A	Correct!
B	The constant is a positive number.
C	You forgot to add the constant of the function to the calculator.
D	You reversed the values of the maximum and minimum.

PTS: 1 DIF: 2 REF: 160b3a1e-4683-11df-9c7d-001185f0d2ea
OBJ: 4-3.4 Determine Maxima and Minima with a Calculator
NAT: NT.CCSS.MTH.10.9-12.A.APR.3 | NT.CCSS.MTH.10.9-12.F.IF.7.c
STA: MCC8.MP.5 LOC: MTH.C.10.07.07.03.014 | MTH.C.10.07.07.03.015
TOP: 4-3 Investigating Graphs of Polynomial Functions DOK: DOK 3

35. ANS: D

The first term is given $a_1 = 6$.
Substitute this value into the rule to find the next term.
Continue using each term to find the next term.

n	$2a_{n-1} - 1$	a_n
1		6
2	$2(6) - 1$	11
3	$2(11) - 1$	21
4	$2(21) - 1$	41
5	$2(41) - 1$	81

	Feedback
A	The first term is given. Use the rule to find each following term.
B	You have the correct first term. Use the rule to find the following terms.
C	Remember to use both parts of the rule when finding each of the terms.
D	Correct!

PTS: 1 DIF: 2 REF: 17f19b6e-4683-11df-9c7d-001185f0d2ea
OBJ: 5-1.1 Finding Terms of a Sequence by Using a Recursive Formula
NAT: NT.CCSS.MTH.10.9-12.F.BF.2 STA: MCC9-12.F.IF.3
LOC: MTH.C.13.06.01.01.003 TOP: 5-1 Introduction to Sequences
DOK: DOK 2

36. ANS: A

Make a table. Evaluate the sequence for $n = 1$ through $n = 5$.

n	$2^n - 5$	a_n
1	$2^1 - 5$	–3
2	$2^2 - 5$	–1
3	$2^3 - 5$	3
4	$2^4 - 5$	11
5	$2^5 - 5$	27

The first 5 terms are –3, –1, 3, 11, and 27.

	Feedback
A	Correct!
B	You added the two terms instead of subtracting.
C	You reversed the values of the power base and exponent.
D	You multiplied instead of raising to the power of n.

PTS: 1 DIF: 1 REF: 17f1c27e-4683-11df-9c7d-001185f0d2ea
OBJ: 5-1.2 Finding Terms of a Sequence by Using an Explicit Formula
NAT: NT.CCSS.MTH.10.9-12.F.BF.2 STA: MCC9-12.F.IF.3
LOC: MTH.C.13.06.01.01.003 TOP: 5-1 Introduction to Sequences
DOK: DOK 2

37. ANS: B

Examine the differences.

	23.1	20.2	17.3	14.4	11.5	8.6
First difference		2.9	2.9	2.9	2.9	2.9

The first differences are constant, so the sequence is linear.

$a_n = 23.1 - 2.9(n-1)$ The first term is 23.1, and each term is 2.9 less than the previous. Use $(n - 1)$ to get 23.1 when $n = 1$.

$a_n = 23.1 - 2.9n + 2.9$ Distribute and simplify.

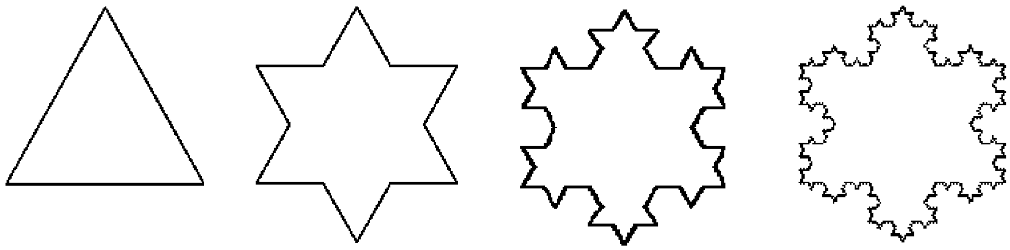
$a_n = 26 - 2.9n$

	Feedback
A	If the first differences are constant, the rule is linear. Add the multiples of the difference to the starting value.
B	Correct!
C	Adjust the rule so that when $n = 1$, the result is 23.1.
D	If the first differences are constant, the rule is linear and not exponential.

PTS: 1 DIF: 2 REF: 17f3fdca-4683-11df-9c7d-001185f0d2ea
OBJ: 5-1.3 Writing Rules for Sequences STA: MCC9-12.F.BF.2
LOC: MTH.C.13.06.03.01.003 TOP: 5-1 Introduction to Sequences
DOK: DOK 3

38. ANS: B

Here are the first 4 iterations.



Each iteration multiplies the number of sides by 4. The number of sides can be represented by the equation $a_n = 3(4)^{n = 1}$.

Use the equation to find a_3 and a_4.

$a_3 = 3(4)^{3 = 1} = 3(4)^2 = 3(16) = 48$

$a_4 = 3(4)^{4 = 1} = 3(4)^3 = 3(64) = 192$

The next two iterations result in 48 and 192 sides.

	Feedback
A	After the iteration, each side is replaced by 4 smaller sides.
B	Correct!
C	After the iteration, each side is replaced by 4 smaller sides.
D	After the iteration, each side is replaced by 4 smaller sides.

PTS: 1 DIF: 2 REF: 17f68736-4683-11df-9c7d-001185f0d2ea
OBJ: 5-1.5 Iteration of Fractals STA: MCC9-12.F.BF.2
TOP: 5-1 Introduction to Sequences DOK: DOK 2

39. ANS: C

Find a rule for the *k*th term.

$a_k = (-1)^k\left(\frac{1}{2k}\right)$ Explicit formula

Write the notation for the first 6 items.

$\sum_{k=1}^{6}(-1)^k\left(\frac{1}{2k}\right)$ Summation notation

	Feedback
A	Is the whole fraction multiplied by *k* or just the denominator?
B	Does the sequence start with a minus sign or a plus sign?
C	Correct!
D	Does the sequence start with a minus sign or a plus sign? Is the whole fraction multiplied by *k* or just the denominator?

PTS: 1 DIF: 2 REF: 17fb24de-4683-11df-9c7d-001185f0d2ea
OBJ: 5-2.1 Using Summation Notation STA: MCC9-12.F.BF.1a
LOC: MTH.C.13.06.01.02.003 TOP: 5-2 Series and Summation Notation
DOK: DOK 3

40. ANS: D

Expand the series by replacing *k*. Then evaluate the sum.

$$\sum_{k=2}^{6}(-1)^k(7k - k^2)$$

$$= (-1)^2((7)(2) - 2^2) + (-1)^3((7)(3) - 3^2)$$

$$+(-1)^4((7)(4) - 4^2) + (-1)^5((7)(5) - 5^2) + (-1)^6((7)(6) - 6^2)$$

$$= 10 - 12 + 12 - 10 + 6$$

$$= 6$$

	Feedback
A	When k is odd, (–1)^ *k* is negative.
B	Expand the series by replacing *k*. Then evaluate the sum.
C	The lower limit for *k* is not 1.
D	Correct!

PTS: 1 DIF: 2 REF: 17fb4bee-4683-11df-9c7d-001185f0d2ea
OBJ: 5-2.2 Evaluating a Series STA: MCC9-12.F.IF.3
LOC: MTH.C.13.06.01.02.004 TOP: 5-2 Series and Summation Notation
DOK: DOK 2

41. ANS: C

$$\sum_{k=1}^{22} k = \frac{n(n+1)}{2} = \frac{22(23)}{2} = 253$$

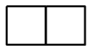
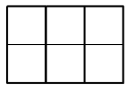
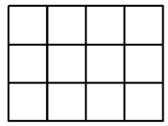
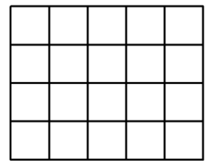
Use the summation formula for a linear series.

	Feedback
A	Use the correct summation formula.
B	Use the summation formula for a linear series.
C	Correct!
D	Find the sum of the first n natural numbers, where n is the number on top of the summation notation.

PTS: 1 DIF: 2 REF: 17fd873a-4683-11df-9c7d-001185f0d2ea
OBJ: 5-2.3 Using Summation Formulas STA: MCC8.MP.8 LOC: MTH.C.13.06.01.02.004
TOP: 5-2 Series and Summation Notation DOK: DOK 2

42. ANS: C

Make a table and a diagram. Number the levels starting from the top level.

Level	1	2	3	4
Diagram				
Blocks	$1 \cdot 2 = 2$	$2 \cdot 3 = 6$	$3 \cdot 4 = 12$	$4 \cdot 5 = 20$

The number of blocks in each level is $k(k+1)$ where k is the level number. Write a series to represent the total number of blocks in n rows.

$\sum_{k=1}^{n} k(k+1)$, where k is the level number and n is the total number of levels.

Evaluate the series for several n-values.

$$\sum_{k=1}^{6} k(k+1) = 1(2) + 2(3) + 3(4) + 4(5) + 5(6) + 6(7) = 112$$

$$\sum_{k=1}^{7} k(k+1) = 1(2) + 2(3) + 3(4) + 4(5) + 5(6) + 6(7) + 7(8) = 168$$

$$\sum_{k=1}^{8} k(k+1) = 1(2) + 2(3) + 3(4) + 4(5) + 5(6) + 6(7) + 7(8) + 8(9) = 240$$

Because Alicia has 200 blocks, the pyramid can have at most 7 levels.

	Feedback
A	Starting from the top level, the number of blocks in each level is $k(k + 1)$. Evaluate the series SUM $k(k + 1)$ from $k = 1$ to n for several values of n.
B	Starting from the top level, the number of blocks in each level is $k(k + 1)$. Evaluate the series SUM $k(k + 1)$ from $k = 1$ to n for several values of n.
C	Correct!
D	Starting from the top level, the number of blocks in each level is $k(k + 1)$. Evaluate the series SUM $k(k + 1)$ from $k = 1$ to n for several values of n.

PTS: 1 DIF: 2 REF: 17ffe996-4683-11df-9c7d-001185f0d2ea
OBJ: 5-2.4 Problem-Solving Application STA: MCC9-12.F.BF.1a
LOC: MTH.C.13.06.01.02.004 TOP: 5-2 Series and Summation Notation
DOK: DOK 2

43. ANS: A

	12		40		68		96
Difference		28		28		28	
Ratio		$\frac{10}{3}$		$\frac{17}{10}$		$\frac{24}{17}$	

It could be arithmetic with $d = 28$.

	Feedback
A	Correct!
B	To find the common ratio divide each term by the previous term. To find the common difference subtract each term from the next term.
C	Is the ratio or difference of successive terms a constant?
D	Find out if the ratio or difference of successive terms is a constant.

PTS: 1 DIF: 1 REF: 180bd562-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.1 Identifying Geometric Sequences STA: MCC9-12.F.BF.2
LOC: MTH.C.13.06.01.01.01.002 | MTH.C.13.06.01.01.007
TOP: 5-3 Geometric Sequences and Series DOK: DOK 2

44. ANS: A
Step 1 Find the common ratio.

$$r = \frac{a_2}{a_1} = \frac{12}{-4} = -3$$

Step 2 Write a rule, and evaluate for $n = 7$.

$a_n = a_1 r^{n-1}$ General rule

$a_7 = -4(-3)^{7-1}$ Substitute –4 for a_1, 7 for n, and –3 for r.

$a_7 = -2{,}916$

The 7th term is –2,916.

	Feedback
A	Correct!
B	Find the 7th term, not the 6th term.
C	Find the 7th term, not the 8th term.
D	First, find the common ratio. Then, use the geometric sequence formula and substitute the values.

PTS: 1 DIF: 2 REF: 180bfc72-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.2 Find the nth Term Given a Geometric Sequence STA: MCC9-12.F.BF.2
LOC: MTH.C.13.06.01.01.02.002 | MTH.C.13.06.01.01.02.003
TOP: 5-3 Geometric Sequences and Series DOK: DOK 2

45. ANS: A

Step 1 Find the common ratio.

$a_5 = a_3 r^{(5-3)}$	Use the given terms.
$a_5 = a_3 r^2$	Simplify.
$64 = 16r^2$	Substitute 64 for a_5 and 16 for a_3.
$4 = r^2$	Divide both sides by 16.
$\pm 2 = r$	Take the square root of both sides.

Step 2 Find a_1.

Consider both the positive and negative values for r.

$a_n = a_1 r^{n-1}$	$a_n = a_1 r^{n-1}$	General rule
$16 = a_1 (2)^{3-1}$	$16 = a_1 (-2)^{3-1}$	Use $a_3 = 16$ and $r = \pm 2$.
$4 = a_1$	$4 = a_1$	Simplify.

Step 3 Write the rule and evaluate for a_7.

Consider both the positive and negative values for r.

$a_n = a_1 r^{n-1}$	$a_n = a_1 r^{n-1}$	General rule
$a_n = 4(2)^{n-1}$	$a_n = 4(-2)^{n-1}$	Substitute for a_1 and r.
$a_7 = 4(2)^{7-1}$	$a_7 = 4(-2)^{7-1}$	Evaluate for $n = 7$.
$a_7 = 256$	$a_7 = 256$	Simplify.

The 7th term is 256.

	Feedback
A	Correct!
B	First find r and $a1$ using the properties of geometric series. Then use $an = a1 * r$^$(n-1)$.
C	The formula for the nth term of a geometric series is $an = r$^$(n-1)$, not $an = r$^$(n-1)$.
D	The formula for the nth term of a geometric series is $an = r$^$(n-1)$.

PTS: 1 DIF: 2 REF: 180e37be-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.3 Finding the nth Term Given Two Terms STA: MCC9-12.F.BF.2
LOC: MTH.C.13.06.01.01.02.002 | MTH.C.13.06.01.01.02.003
TOP: 5-3 Geometric Sequences and Series DOK: DOK 2

46. ANS: D

$\pm\sqrt{ab}$	Geometric mean formula
$= \pm\sqrt{\left(-\frac{1}{48}\right)\left(-\frac{1}{75}\right)}$	Substitute into the formula.
$= \pm\sqrt{\frac{1}{3600}}$	Multiply.
$= \pm\frac{1}{60}$	Simplify.

	Feedback
A	Find the square root of the product of the two numbers.
B	Find the square root of the product of the two numbers.
C	The geometric mean is the term between any two nonconsecutive terms of a geometric sequence.
D	Correct!

PTS: 1 DIF: 2 REF: 18109a1a-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.4 Finding Geometric Means STA: MCC9-12.F.BF.2
LOC: MTH.C.13.04.02.01.01.004 TOP: 5-3 Geometric Sequences and Series
DOK: DOK 2

47. ANS: A

Step 1 Find the common ratio.

$r = \frac{+0.6}{6} = 0.1$

Step 2 Find S_8 with $a_1 = 6$, $r = 0.1$, and $n = 8$.

$S_n = a_1\left(\frac{1-r^n}{1-r}\right)$	Sum formula
$S_8 = 6\left(\frac{1-(0.1^8)}{1-(0.1)}\right)$	Substitute.
$S_8 = 6\left(\frac{1-(0.00000001)}{1-(0.1)}\right)$	Use the order of operations. Calculate exponents before adding or subtracting.
$S_8 = 6\left(\frac{0.99999999}{0.9}\right) = 6.6666666$	Simplify.

The sum of the first 8 terms of the geometric sequence is 6.6666666.

	Feedback
A	Correct!
B	This is the common ratio. Use the sum formula for geometric sequences.
C	This is the opposite of the product of the common ratio and the term number. Use the sum formula for geometric sequences.
D	Pay attention to the order of operations. Raise *r* to the nth power before subtracting from 1.

PTS: 1 DIF: 2 REF: 1810c12a-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.5 Finding the Sum of a Geometric Series NAT: NT.CCSS.MTH.10.9-12.A.SSE.4
STA: MCC9-12.A.SSE.4 LOC: MTH.C.13.06.01.02.008
TOP: 5-3 Geometric Sequences and Series DOK: DOK 2

48. ANS: D

Step 1 Write a sequence.

Let
n = number of matches played in the n^{th} round.
S_n = total number of matches

$a_n = 128\left(\frac{1}{2}\right)^{n-1}$ The first round requires 128 matches. Each successive match requires $\frac{1}{2}$ as many matches.

Step 2 Find the number of matches required.

$1 = 128\left(\frac{1}{2}\right)^{n-1}$ The final round will have 1 match, so substitute 1 for a_n.

$\frac{1}{128} = \left(\frac{1}{2}\right)^{n-1}$ Isolate the exponential expression by dividing by 128.

$\left(\frac{1}{2}\right)^{7} = \left(\frac{1}{2}\right)^{n-1}$ Express the left side as a power of $\frac{1}{2}$.

$7 = n - 1$ Equate the exponents.

$8 = n$ Solve for n.

Step 3 Find the total number of matches after 8 rounds.

$$S_n = 128\left(\frac{1-\left(\frac{1}{2}\right)^{8}}{1-\left(\frac{1}{2}\right)}\right) = 255$$ Sum function for geometric series

255 matches must be scheduled to complete the tournament.

	Feedback
A	Determine how many rounds will be needed, then use the sum function for a geometric series to find the total number of matches.
B	Determine how many rounds will be needed, then use the sum function for a geometric series to find the total number of matches.
C	Determine how many rounds will be needed, then use the sum function for a geometric series to find the total number of matches.
D	Correct!

PTS: 1 DIF: 2 REF: 1812fc76-4683-11df-9c7d-001185f0d2ea
OBJ: 5-3.6 Application STA: MCC9-12.A.SSE.4
LOC: MTH.C.13.06.01.02.008 TOP: 5-3 Geometric Sequences and Series
DOK: DOK 2

49. ANS: D

Step 1 Find the common ratio.

$a_{11} = a_6 r^{11-6}$	Use the given terms.
$a_{11} = a_6 r^5$	Simplify.
$4{,}096 = -128r^5$	Substitute 4,096 for a_{11} and -128 for a_6.
$-32 = r^5$	Divide both sides by -128.
$-2 = r$	Take the fifth root of both sides.

Step 2 Find a_1.

$a_6 = a_1 r^{6-1}$	
$-128 = a_1(-2)^5$	Substitute $a_6 = -128$ and $r = -2$. Simplify.
$4 = a_1$	Divide both sides by $(-2)^5$.

Step 3 Find a_2 and a_3.

$a_n = a_1 r^{n-1}$	General rule for geometric sequence
$a_2 = a_1(-2)^{2-1}$	Substitute $n = 2$, $a_1 = 4$, and $r = -2$.
$a_2 = 4(-2)^1 = -8$	Simplify.
$a_3 = a_1(-2)^{3-1}$	Substitute $n = 3$, $a_1 = 4$, and $r = -2$.
$a_3 = 4(-2)^2 = 16$	Simplify.

	Feedback
A	First, find the common ratio. Then, use it to find the first, second, and third terms.
B	First, find the common ratio. Then, use it to find the first, second, and third terms.
C	First, find the common ratio. Then, use it to find the first, second, and third terms.
D	Correct!

PTS: 1 DIF: 3 REF: 18155ed2-4683-11df-9c7d-001185f0d2ea
STA: MCC9-12.F.BF.2 LOC: MTH.C.13.06.01.01.02.002 | MTH.C.13.06.01.01.02.003
TOP: 5-3 Geometric Sequences and Series KEY: multi-step
DOK: DOK 2

50. ANS: A

$(f-g)(x) = f(x) - g(x)$

$= (2x^2 + 8x - 4) - (-5x + 6)$ Substitute function rules.

$= 2x^2 + 13x - 10$ Distribute the negative and combine like terms.

	Feedback
A	Correct!
B	Make sure to combine like terms.
C	Be sure to distribute the negative sign.
D	Make sure to combine like terms.

PTS: 1 DIF: 1 REF: 171d6972-4683-11df-9c7d-001185f0d2ea
OBJ: 14-1.1 Adding and Subtracting Functions NAT: NT.CCSS.MTH.10.9-12.F.BF.1.b
STA: MCC9-12.F.BF.1b LOC: MTH.C.10.07.15.02.001 | MTH.C.10.07.15.03.001
TOP: 14-1 Operations with Functions DOK: DOK 2

51. ANS: B

$(fg)(x) = f(x) \cdot g(x)$

$= (4x^2 + 3x - 5)(-2x + 12)$ Substitute function rules.

$= 4x^2(-2x + 12) + 3x(-2x + 12) - 5(-2x + 12)$ Distribute.

$= -8x^3 + 48x^2 - 6x^2 + 36x + 10x - 60$ Multiply.

$= -8x^3 + 42x^2 + 46x - 60$ Combine like terms.

	Feedback
A	Make sure to distribute the terms completely.
B	Correct!
C	Make sure to distribute the terms completely.
D	Be sure to check the powers of the variables

PTS: 1 DIF: 2 REF: 171fcbce-4683-11df-9c7d-001185f0d2ea
OBJ: 14-1.2 Multiplying and Dividing Functions NAT: NT.CCSS.MTH.10.9-12.F.BF.1.c
STA: MCC9-12.F.BF.1b LOC: MTH.C.10.07.15.03.001
TOP: 14-1 Operations with Functions DOK: DOK 2

52. ANS: C

$g(f(3))$	$= g(3^3)$	$f(x) = x^3$
	$= g(27)$	Simplify.
	$= 4(27) + 3$	$g(x) = 4x + 3$
	$= 111$	Simplify.

So, $g(f(3)) = 111$.

	Feedback
A	Complete the calculation for $g(x)$.
B	This is the result of reversing the order of the functions. Find $f(x)$ first, then use that result to find $g(x)$.
C	Correct!
D	This is the result of multiplying instead of composition. Find $f(x)$ first, then use that result to find $g(x)$.

PTS: 1 DIF: 2 REF: 171ff2de-4683-11df-9c7d-001185f0d2ea
OBJ: 14-1.3 Evaluating Composite Functions NAT: NT.CCSS.MTH.10.9-12.F.BF.1.c
STA: MCC9-12.F.BF.1c LOC: MTH.C.10.07.15.05.006
TOP: 14-1 Operations with Functions DOK: DOK 1

53. ANS: C

Substitute the rule for f into g.

$g(f(x)) = g(\sqrt{x-2})$

Use the rule for g.

$g(f(x)) = g(\sqrt{x-2}) = \dfrac{6}{\sqrt{x-2} - 3} + 1$

The domain is $x \geq 2$, $x \neq 11$ because $f(x)$ is undefined for $x < 2$ and $g(f(x))$ is undefined when x is 11.

	Feedback
A	This looks like $f(g(x))$, now find $g(f(x))$.
B	Check if there are any values that make the denominator zero.
C	Correct!
D	This looks like $f(g(x))$, now find $g(f(x))$.

PTS: 1 DIF: 2 REF: 17222e2a-4683-11df-9c7d-001185f0d2ea
OBJ: 14-1.4 Writing Composite Functions NAT: NT.CCSS.MTH.10.9-12.F.BF.1.c
STA: MCC9-12.F.BF.1c LOC: MTH.C.10.07.15.05.002 | MTH.C.10.07.15.05.003
TOP: 14-1 Operations with Functions DOK: DOK 3

54. ANS: C

Step 1 Write a function for the oven temperature in Fahrenheit at an elevation of over 3,500 feet.
$F(t) = t + 25$

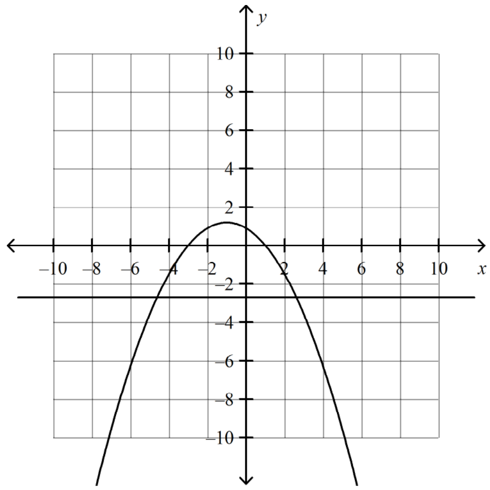
Step 2 Write a function for the oven temperature in Celsius based on the temperature in Fahrenheit.
$C(t) = \frac{5}{9}(t - 32)$ Use the formula that converts Fahrenheit to Celsius.

Step 3 Find the composition $C\left(F(t)\right)$.
$C\left(F(t)\right) = \frac{5}{9}\left(F(t) - 32\right)$ Substitute $F(t)$ for t.
$C\left(F(t)\right) = \frac{5}{9}\left((t + 25) - 32\right)$ Replace $F(t)$ with its rule.
$C\left(F(t)\right) = \frac{5}{9}(t - 7)$ Simplify.

	Feedback
A	Use the formula that converts Fahrenheit to Celsius.
B	This is the function to convert degrees in Celsius to Fahrenheit.
C	Correct!
D	This is the function to convert degrees in Fahrenheit to Celsius.

PTS: 1 DIF: 2 REF: 1722553a-4683-11df-9c7d-001185f0d2ea
OBJ: 14-1.5 Application STA: MCC9-12.F.BF.1c
LOC: MTH.C.10.07.15.05.002 TOP: 14-1 Operations with Functions
DOK: DOK 3

55. ANS: C



The inverse is not a function because some horizontal lines pass through more than one point on the graph.

	Feedback
A	The inverse is a function if and only every horizontal line passes through at most one point on the graph.
B	The inverse is a function if and only every horizontal line passes through at most one point on the graph.
C	Correct!
D	The inverse is a function if and only every horizontal line passes through at most one point on the graph.

PTS: 1 DIF: 1 REF: 17249086-4683-11df-9c7d-001185f0d2ea
OBJ: 14-2.1 Using the Horizontal-Line Test NAT: NT.CCSS.MTH.10.9-12.F.IF.1
STA: MCC9-12.F.BF.4b LOC: MTH.C.10.07.14.02.01.001
TOP: 14-2 Functions and Their Inverses DOK: DOK 1

56. ANS: B

$y = (3x - 24)^4$	Rewrite the function using y instead of $f(x)$.
$x = \left(3y - 24\right)^4$	Switch x and y in the equation.
$\sqrt[4]{x} = \sqrt[4]{\left(3y - 24\right)^4}$	Take the fourth root of both sides.
$\pm\sqrt[4]{x} = 3y - 24$	Note the domain restriction $x \geq 0$.
$y = \frac{1}{3}\left(\pm\sqrt[4]{x} + 24\right)$	Isolate y.
$y = \pm\frac{1}{3}\sqrt[4]{x} + 8$	Simplify.

Because of the ± there are two y-values for all $x > 0$. Thus, the inverse is not a function.
The domain of the inverse is the range of $f(x)$: $\left[0, \infty\right)$. The range is the domain of $f(x)$: $\left(-\infty, \infty\right)$.

	Feedback
A	The fourth root of (3y – 24)^4 is ±(3y – 24).
B	Correct!
C	The fourth root of (3y – 24)^4 is ±(3y – 24).
D	The fourth root of (3y – 24)^4 is ±(3y – 24).

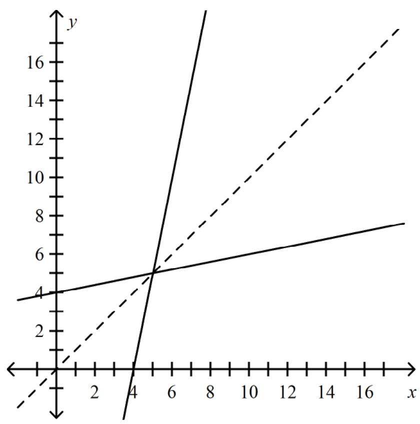
PTS: 1 DIF: 2 REF: 1726f2e2-4683-11df-9c7d-001185f0d2ea
OBJ: 14-2.2 Writing Rules for Inverses NAT: NT.CCSS.MTH.10.9-12.F.BF.4.a
STA: MCC9-12.F.BF.4b LOC: MTH.C.10.07.14.02.005
TOP: 14-2 Functions and Their Inverses DOK: DOK 2

57. ANS: A
Find the compositions $f(g(x))$ and $g(f(x))$.

$f(g(x)) = \frac{1}{5}\left(5x - 20\right) + 4$ $f(g(x)) = (x - 4) + 4$ $f(g(x)) = x$	$g(f(x)) = 5(\frac{1}{5}x + 4) - 20$ $g(f(x)) = (x + 20) - 20$ $g(f(x)) = x$

Because $f(g(x)) = g(f(x)) = x$, f and g are inverses.

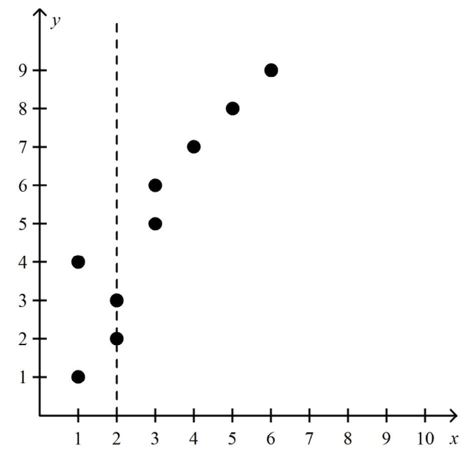
Check The graphs are symmetric about the line $y = x$.



	Feedback
A	Correct!
B	Find the compositions $f(g(x))$ and $g(f(x))$.

PTS: 1 DIF: 2 REF: 172719f2-4683-11df-9c7d-001185f0d2ea
OBJ: 14-2.3 Determining Whether Functions Are Inverses NAT: NT.CCSS.MTH.10.9-12.F.BF.4.b
STA: MCC9-12.F.BF.4b LOC: MTH.C.10.07.14.02.007
TOP: 14-2 Functions and Their Inverses DOK: DOK 1

58. ANS: D
The relation does not pass the vertical line test, so it is not a function.



But the relation does pass the horizontal line test, so its inverse is a function.
Therefore, the relation is not a function, but its inverse is a function.

	Feedback
A	Use the horizontal line test to determine if the inverse is a function.
B	Use the vertical line test to determine if the relation is a function.
C	Use the vertical line test to determine if the relation is a function and the horizontal line test to determine if the inverse is a function.
D	Correct!

PTS: 1 DIF: 3 REF: 1729553e-4683-11df-9c7d-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.F.BF.4 STA: MCC9-12.F.BF.4b
LOC: MTH.C.10.07.01.02.005 | MTH.C.10.07.14.02.01.001 TOP: 14-2 Functions and Their Inverses
DOK: DOK 1

GSE Algebra 2 practice exam [Answer Strip] **ID: A**

B	1.
A	2.
C	3.
A	4.
B	5.
B	6.
B	7.
C	8.
B	9.
A	10.
D	11.
C	12.
A	13.
C	14.
D	15.
B	16.
C	17.
B	18.
A	19.
A	20.
C	21.
D	22.
A	23.
B	24.

GSE Algebra 2 practice exam [Answer Strip] ID: A

D 25.

D 26.

A 27.

D 28.

C 29.

C 30.

D 31.

C 32.

D 33.

A 34.

D 35.

A 36.

B 37.

B 38.

C 39.

D 40.

C 41.

C 42.

A 43.

A 44.

A 45.

D 46.

A 47.

D 48.

D 49.

GSE Algebra 2 practice exam [Answer Strip] **ID: A**

A 50.

B 51.

C 52.

C 53.

C 54.

C 55.

B 56.

A 57.

D 58.