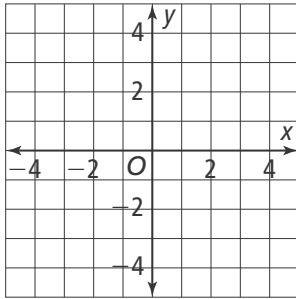


Mid-Year Assessment

1. Graph the function.

$$y = \begin{cases} -4, & x < 1 \\ 5x - 9, & 1 < x \leq 2 \\ 1, & x > 2 \end{cases}$$



2. What are the domain and range of the function in Item 1?

domain: _____

range: _____

3. What is the average rate of change over the interval $[\frac{1}{2}, \frac{2}{3}]$ for the function in Item 1?

- (A) $-\frac{17}{2}$
 (B) $-\frac{13}{2}$
 (C) 0
 (D) 5

4. Write the first four terms of the sequence defined by

$$a_n = \begin{cases} 5, & n = 1 \\ a_{n-1} + 3, & n > 1 \end{cases}$$

- (A) 5, 2, -1, -4, ...
 (B) 5, 15, 45, 135, ...
 (C) 5, 8, 11, 14, ...
 (D) 5, 4, 3, 2, ...

5. Solve the system of equations.

$$\begin{aligned} 2x + 5y &= -4 \\ -x - 3y &= 1 \end{aligned}$$

6. What is the equation in vertex form of a parabola with a vertex of $(-3, 4)$ that passes through the point $(1, -4)$?

- (A) $y = \frac{1}{2}(x + 3)^2 - 4$
 (B) $y = -\frac{1}{2}(x - 3)^2 - 4$
 (C) $y = -\frac{1}{2}(x + 3)^2 + 4$
 (D) $y = -2(x + 3)^2 - 4$

7. Solve the equation $x^2 - x = 30$.

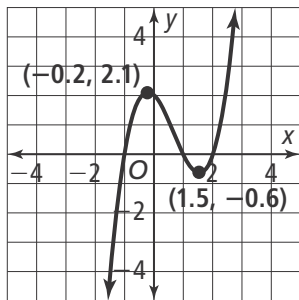
- (A) $x = 5$ and $x = -6$
 (B) $x = -5$ and $x = 6$
 (C) $x = 3$ and $x = -10$
 (D) $x = -3$ and $x = -10$

8. A stone is tossed from the top of a cliff. The function $h(t) = -16t^2 - 48t + 160$ gives the height, in feet, of the stone t seconds after it is tossed. How long will it be before the stone hits the ground?

9. Write the product $(7 + 3i)(7 - 3i)$ in the form $a + bi$.

- (A) $49 - 9i$
 (B) $49 - 9i^2$
 (C) 40
 (D) 58

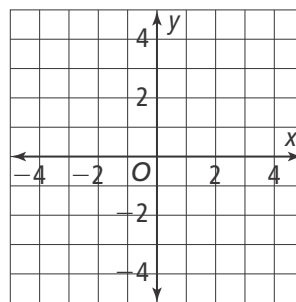
10. Solve $x^2 - 2x + 9 = 0$ using the Quadratic Formula.
- (A) $x = 1 + 2i\sqrt{2}$ and $x = 1 - 2i\sqrt{2}$
- (B) $x = 1 + 2\sqrt{10}$ and $x = 1 - 2\sqrt{10}$
- (C) $x = 1$ and $x = 9$
- (D) $x = \frac{1}{2} + 2i$ and $x = \frac{1}{2} - 2i$
-
11. For the polynomial $x^5 - 2x^6 + 3$, which of these statement(s) is true? Select all that apply.
- (A) The polynomial is a trinomial.
- (B) The degree of the polynomial is 6.
- (C) The leading coefficient is 1.
- (D) Written in standard form, the polynomial is $-2x^6 + x^5 + 3$.
-
12. The graph of function f is shown. Use the zeros to find the rule for f .



- (A) $f(x) = x^3 - 2x^2 - x + 2$
- (B) $f(x) = x^3 + 2x^2 - x - 2$
- (C) $f(x) = -x^3 + 2x^2 + x - 2$
- (D) $f(x) = x^3 - 2$

13. Is $x + 2$ a factor of $P(x) = x^3 + 5x^2 + 11x + 10$? If it is, write $P(x)$ as a product of the two factors.
-

14. Sketch a graph of the polynomial function $f(x) = x^3 - x^2 - 2x$. Use the graph complete the statements below, where values are rounded to the nearest tenth.



f is _____ on the intervals $(-\infty, -1)$ and $(0, 2)$.

f is _____ on the intervals $(-1, 0)$ and $(2, \infty)$.

f is _____ on the intervals $(-\infty, -0.5)$ and $(1.2, \infty)$.

f is _____ on the interval $(-0.5, 1.2)$.

15. What are all the real and complex solutions of $x^3 - 2x^2 + 9x - 8 = 10$?
- (A) $3i, -3i, 2$
- (B) $3i, -2, 2$
- (C) $3i, -3i, -2$
- (D) $3, -3, 2i$

16. Add $\frac{12}{a-4} + \frac{3a}{4-a}$. State the sum and any restrictions on the variables.
-

17. R varies inversely with x . If $R = -2$ when $x = 6$, what is the value of R when $x = -3$?

(A) -1
(B) 4
(C) -4
(D) 1

18. Identify the horizontal and vertical asymptotes of the graph of

$$y = \frac{x^2 - x - 6}{14 - 9x + x^2}$$

19. Describe the transformations needed to translate the graph of $y = \frac{1}{x}$ to the graph of $y = \frac{1}{x+1} - 3$.

(A) to the right 1 and down 3
(B) to the right 1 and up 3
(C) to the left 1 and down 3
(D) to the left 1 and up 3

20. If $a = \frac{1}{x} - \frac{1}{y}$, what is the value of $\frac{1}{a}$?

(A) $\frac{xy}{y-x}$
(B) $\frac{1}{x-y}$
(C) $\frac{xy}{x-y}$
(D) $x-y$

21. Simplify $\sqrt[4]{16a^4b^{20}}$

(A) $4a^2b^{10}$
(B) $4a^2|b^5|$
(C) $2b^{16}$
(D) $2|a| \cdot |b^5|$

22. Which of the following is equivalent to $\frac{14}{3-\sqrt{2}}$?

(A) $\frac{42 - 14\sqrt{2}}{11}$
(B) $6 + 2\sqrt{2}$
(C) $6 - 2\sqrt{2}$
(D) $4\sqrt{2}$

23. The graph of $y = \sqrt{x}$ has been translated to the right 1 unit and up 4 units. What is the equation of the translated graph?

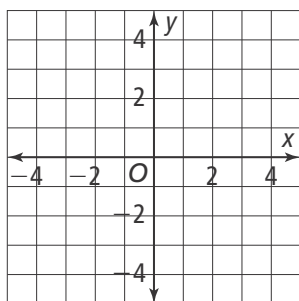
- (A) $y = 1 + \sqrt{x + 4}$
- (B) $y = 4 - \sqrt{x - 1}$
- (C) $y = 4 + \sqrt{x - 1}$
- (D) $y = 3 + \sqrt{x}$

24. The function g has domain $x \geq 0$ and range $y \geq 3$. What are the domain and range of g^{-1} ?

domain: _____

range: _____

25. Graph the function $f(x) = -2 + \sqrt{x}$.



26. Given $f(x) = 4x^2 - 4x + 1$ and $g(x) = 2x - 1$, which of the following are expression(s) for $f \cdot g$? Select all that apply.

- (A) $6x^3 + 6x^2 - 6x + 1$
- (B) $(2x - 1)^3$
- (C) $8x^3 - 12x^2 + 6x - 1$
- (D) $4x^2 - 2x$

27. Let $f(x) = \sqrt{x - 2}$ and $g(x) = 3x$. Write an expression for $f \circ g$. What is the domain of $f \circ g$?

expression for $f \circ g$: _____

domain of $f \circ g$: _____

28. If $h(x) = 4x - 3$, what is an equation for $h^{-1}(x)$?

- (A) $h^{-1}(x) = 3x + 4$
- (B) $h^{-1}(x) = 3x - 4$
- (C) $h^{-1}(x) = \frac{x + 3}{4}$
- (D) $h^{-1}(x) = \frac{x - 3}{4}$

29. If $f(x) = \sqrt{x - 3}$, which of the following are true? Select all that apply.

- (A) $f^{-1}(0) = 3$
- (B) $f^{-1}(-1) = 4$
- (C) $f \circ f^{-1}(7) = 7$
- (D) $f^{-1}(12) = 3$

30. Solve $\sqrt{x + 7} - 1 = \sqrt{3x + 10}$

- (A) -3
- (B) 0
- (C) 2
- (D) 9

31. Which function represents the exponential function $f(x) = 5^x$ after a horizontal stretch by a factor of 2 and a reflection across the x -axis?

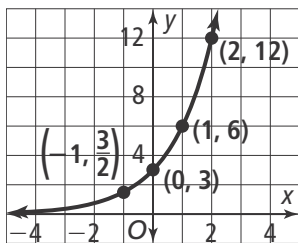
- Ⓐ $g(x) = \left(-\frac{1}{2}\right)5^x$
 Ⓑ $g(x) = -5^{\frac{x}{2}}$
 Ⓒ $g(x) = -2 \cdot 5^x$
 Ⓓ $g(x) = -5^{2x}$

32. For the function $f(x) = \frac{1}{3} \cdot 6^x$, identify the y -intercept and the asymptote.

y -intercept: _____

asymptote: _____

33. Which of the following functions has a greater average rate of change on the interval $(0, 2)$ than the function shown in the graph?



- Ⓐ $f(x) = 5 \cdot 2^x$
 Ⓑ $f(x) = 2^x$
 Ⓒ $f(x) = \left(\frac{1}{2}\right)^x$
 Ⓓ $f(x) = \frac{1}{3} \cdot 2^x$

34. A colony of spiders has a population of 350. The population is decreasing at a rate of 3% per year. Write an exponential decay function for the quarterly decay rate. What does the y -intercept of its graph mean in this context? Round values to the nearest thousandth.

function: _____

The y -intercept is the _____

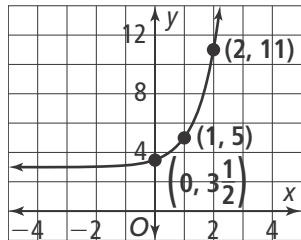
at time _____.

35. Which function is the inverse of the exponential function $y = \left(\frac{3}{2}\right)^x$?

- Ⓐ $y = \left(\frac{2}{3}\right)^x$
 Ⓑ $y = x^{\frac{3}{2}}$
 Ⓒ $y = \log_{\frac{3}{2}} x$
 Ⓓ $y = \log_x \left(\frac{2}{3}\right)$

36. What is the solution to the equation $\log_2(5x - 2) = -2$?

37. The graph shows the function $f(x) = \frac{1}{2} \cdot 4^x + 3$. What is the value of the inverse function f^{-1} at $x = 5$?



- (A) 5
 (B) $3\frac{1}{2}$
 (C) 1
 (D) 2

-
38. Find the equation of the inverse of the function $f(x) = \log_5(2x)$.

39. Which of the following is equivalent to the expression $\log \frac{m^2}{np^4}$?
- (A) $2 \log m - \log n - 4 \log p$
 (B) $\frac{\log m^2}{4 \log np}$
 (C) $2 \log m - \log n + 4 \log p$
 (D) $8 \frac{\log m}{\log np}$

-
40. Write a recursive and an explicit definition for the geometric sequence 2, 6, 18, 54, ... What is the sum of the first 5 terms in the sequence?

recursive: _____

explicit: _____

sum: _____