

1. If $x > 0$ and $y < 0$, which of the following inequalities is/are true? *Lesson 1*

I. $x^2y < 0$

II. $\frac{y-x}{xy} > 0$

III. $y(x - y) > 0$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III are all true
- E. I, II, and III are all false

2. Rationalizing the denominators and simplify. *Lesson 2*

$$\sqrt{\frac{1}{18x^3y^4}}$$

- A. $\frac{\sqrt{2x}}{12x^3y^2}$
- B. $\frac{1}{3xy^2}$
- C. $\frac{1}{6x^2y^2}$
- D. $\frac{\sqrt{2x}}{6x^2y^2}$
- E. $\frac{1}{9x^2y^2}$

3. Perform the indicated operations and simplify: *Lesson 3*

$$\frac{x}{x+1} - \frac{1}{x-1}$$

- A. $\frac{x-1}{2}$
- B. $\frac{1}{x+1}$
- C. 1
- D. $\frac{x-1}{x+1}$
- E. $\frac{x^2-2x-1}{x^2-1}$

4. Simplify; do not include negative exponents in your final answer. *Lesson 6*

$$\frac{xy^{-1}}{(x+y)^{-1}}$$

- A. $\frac{x+y}{xy}$
B. $\frac{xy}{x+y}$
C. $\frac{x(x+y)}{y}$
D. $\frac{x^2}{x+y}$
E. None of the above

5. Solve $P + N = \frac{C+2}{C}$ for C . *Lesson 7*

- A. $C = \frac{P+N}{2}$
B. $C = \frac{2}{P+N-1}$
C. $C = \frac{2}{P+N}$
D. $C = \frac{PN}{2}$
E. $C = \frac{2}{PN-1}$

6. Solve for x : *Lessons 10 and 11*

$$(x-2)(x+1) = 3$$

- A. $x = -1, 2$
B. $x = 2, 5$
C. $x = \frac{1}{2} \pm \frac{\sqrt{5}}{2}$
D. $x = -\frac{1}{4} \pm \frac{\sqrt{21}}{4}$
E. None of the above

7. Solve for x . Choose the answer that best describes the solution(s). *Lesson 14*

$$x + \sqrt{5x + 19} = -1$$

- A. There are two solutions.
One is positive and one is negative.
- B. There are two solutions.
Both are positive.
- C. There are two solutions.
Both are negative.
- D. There is one solution.
It is positive.
- E. There is one solution.
It is negative.

8. Solve the inequality: *Lesson 15*

$$2|-11 - 7x| - 2 \geq 10$$

- A. $\left[-\frac{17}{7}, -\frac{5}{7}\right]$
- B. $\left(-\infty, -\frac{17}{7}\right] \cup \left[-\frac{5}{7}, \infty\right)$
- C. $\left[\frac{5}{7}, \frac{17}{7}\right]$
- D. $\left(-\infty, \frac{5}{7}\right] \cup \left[\frac{17}{7}, \infty\right)$
- E. None of the above

9. Describe the set of all points (x, y) in the coordinate plane, such that $\frac{y}{x} > 0$. *Lesson 16*

- A. The set of all points in quadrants II and IV only.
- B. The set of all points in quadrants I and III only.
- C. The set of all points in quadrants I and II only.
- D. The set of all points in quadrants III and IV only.
- E. None of the above

10. Give the equation of the line in slope-intercept form which is perpendicular to the line $2x - 3y = 7$ and contains the point $(4, -1)$. *Lesson 18*

A. $y = \frac{3}{2}x - 7$

B. $y = -\frac{2}{3}x + \frac{5}{2}$

C. $y = \frac{2}{3}x - \frac{11}{3}$

D. $y = -\frac{3}{2}x + 5$

E. None of the above

11. If $f(x) = -x^2 + x + 2$, find $\frac{f(x+h)-f(x)}{h}$. *Lessons 20 and 21*

A. $-2x - h$

B. $-h^2$

C. $-2x - h^2 + h$

D. $-h + 1$

E. $-2x - h + 1$

12. The point $P(5, -3)$ is on the graph of a basic function, $y = f(x)$. Find the corresponding point on the graph of $y = 4f\left(-\frac{1}{3}x\right) - 2$. *Lesson 22*

A. $(-15, -14)$

B. $\left(-\frac{5}{3}, -14\right)$

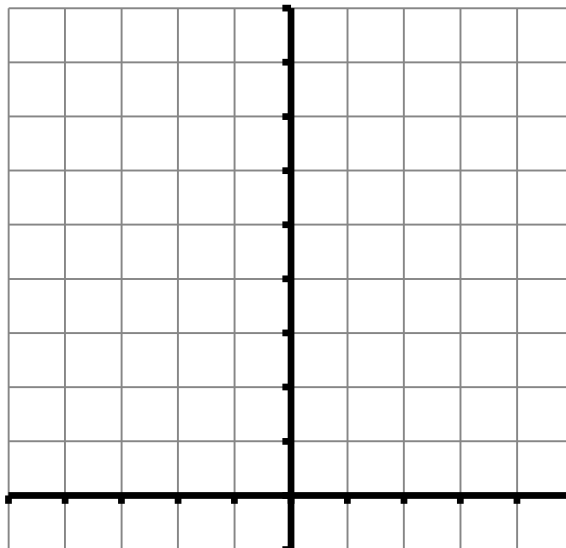
C. $(-15, -20)$

D. $\left(-\frac{5}{3}, -20\right)$

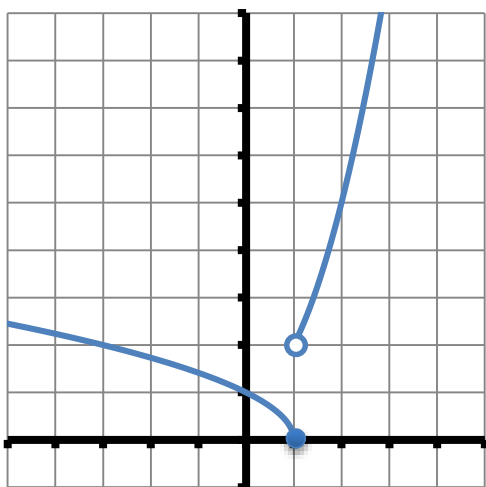
E. None of the above

13. Which of the following is the correct graph of the piecewise defined function f ? *Lesson 24*

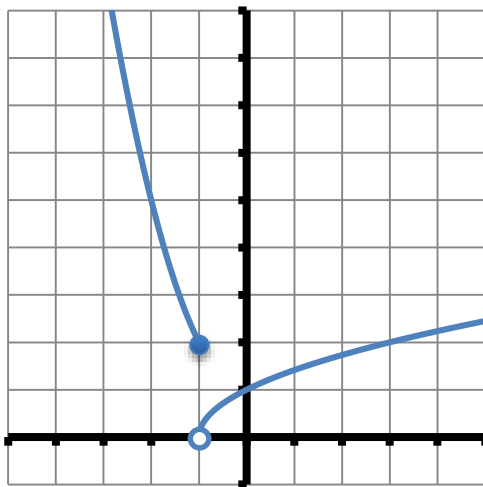
$$f(x) = \begin{cases} x^2 + 1; & x \leq -1 \\ \sqrt{x + 1}; & x > -1 \end{cases}$$



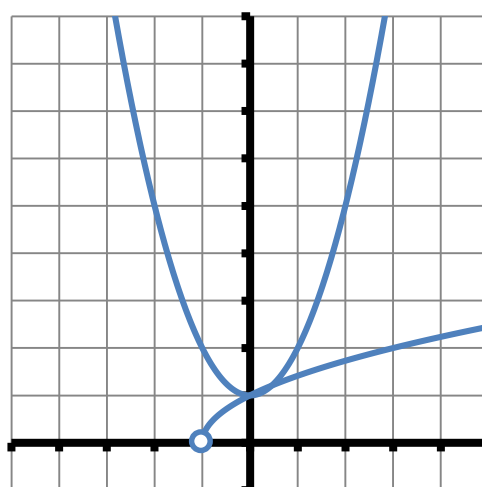
A.



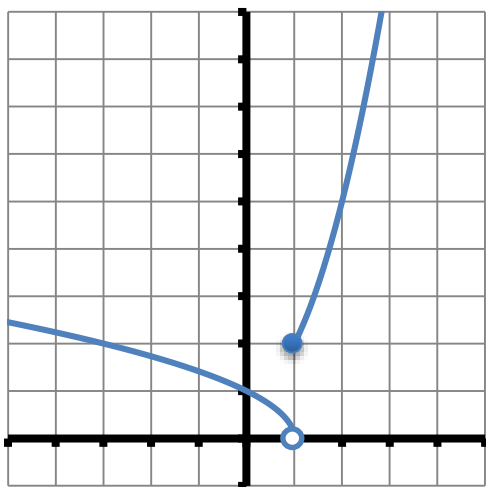
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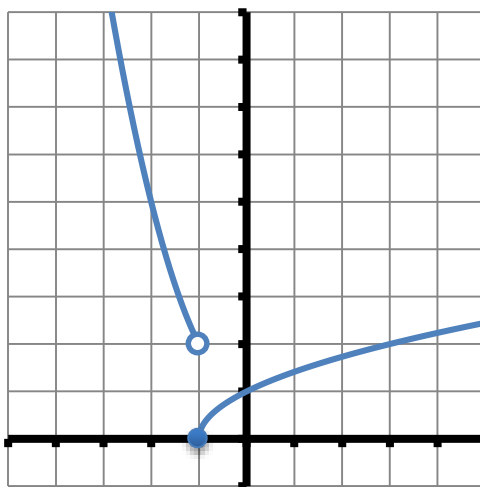
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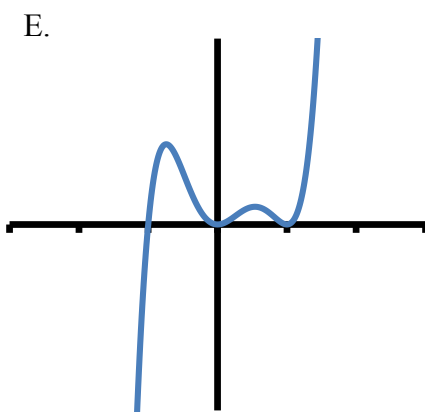
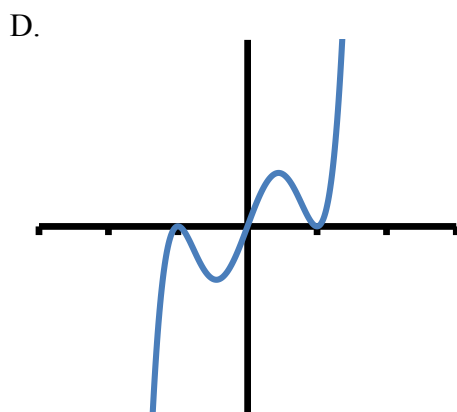
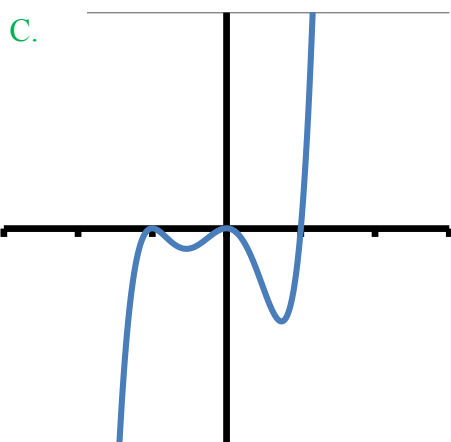
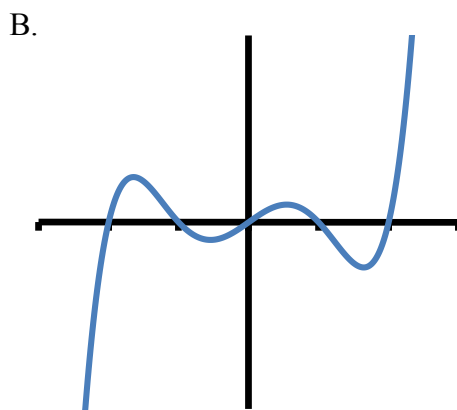
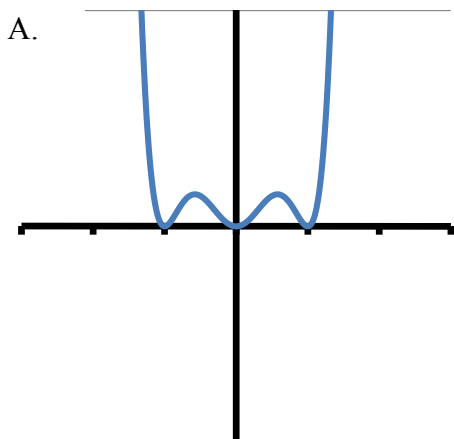
D.



E.



14. Which of the following is the graph of the function $f(x) = x^2(x - 1)(x + 1)^2$?
 (each tick mark represents one unit on the graph) *Lesson 29*



15. Solve the system of equations, then indicate the number of times the graphs intersect. *Lessons 31 and 32*

$$\begin{cases} x^2 + y^2 = 25 \\ y = x^2 - 5 \end{cases}$$

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

16. Suppose f and g are one-to-one functions such that $f(2) = 7$, $f(4) = 2$, $g(2) = 5$, and $g(3) = 2$. Which of the following compositions is/are true: *Lessons 27 and 34*

- A. $(g \circ f^{-1})(7) = 5$
- B. $(f \circ g^{-1})(5) = 4$
- C. $(f^{-1} \circ g^{-1})(2) = 7$
- D. More than one of the above
- E. None of the above

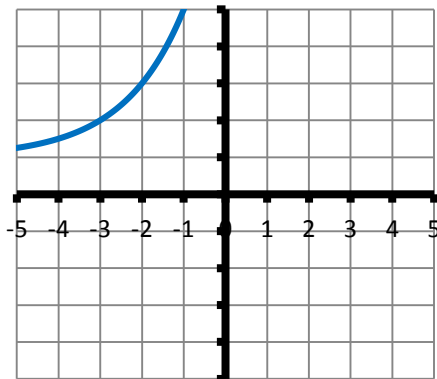
17. Find the inverse of the function $f(x) = \ln(x - 2)$ *Lessons 34, 35, and 36*

- A. $f^{-1}(x) = e^{x+2}$
- B. $f^{-1}(x) = 10^{x+2}$
- C. $f^{-1}(x) = e^x + 2$
- D. $f^{-1}(x) = 10^x + 2$
- E. None of the above

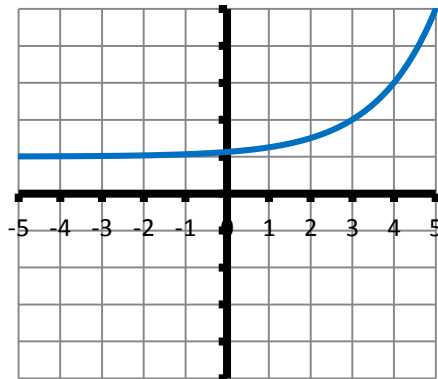
18. If $f(x) = 2^x$, which of the following graphs represents $f(x - 3) + 1$?

(each tick mark represents one unit on the graph) *Lessons 22, 23, and 35*

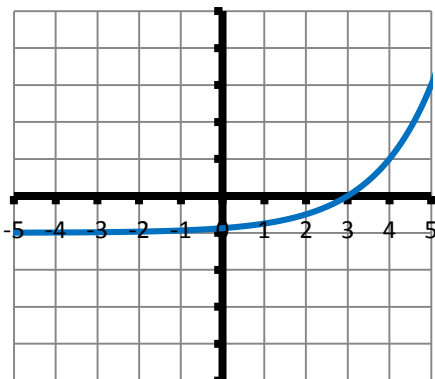
A.



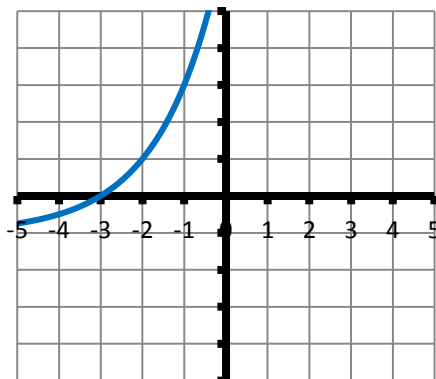
B.



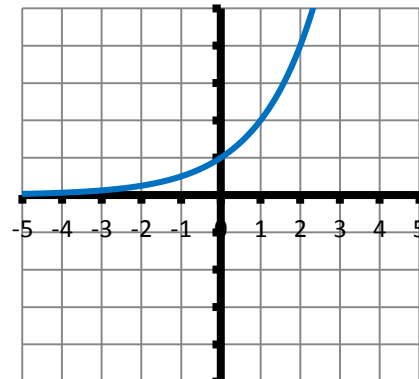
C.



D.

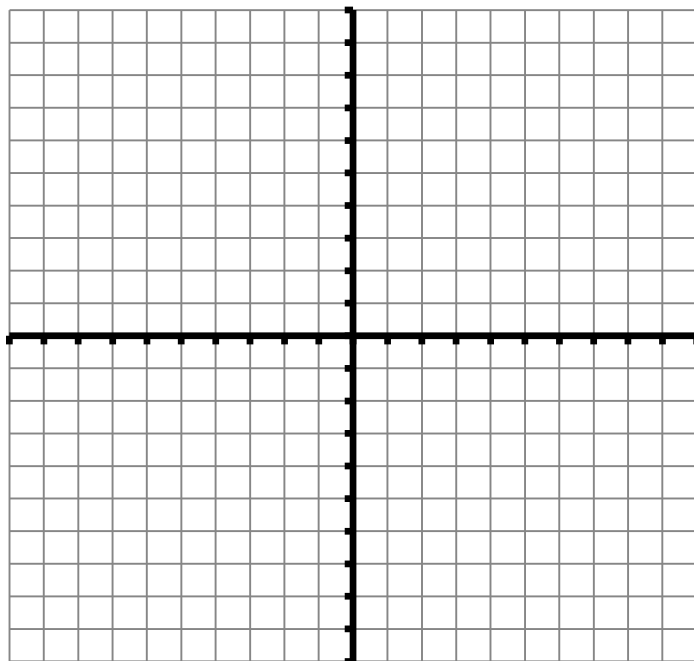


E.



19. Which of the following statements is true about the function $f(x) = \log_2 x$, and its graph?

Lessons 36 and 37



- A. The domain of f is $(-\infty, \infty)$
- B. There is no y -intercept
- C. The function is positive on the interval $(0, \infty)$
- D. The graph of f is decreasing throughout its domain
- E. There no zeros

20. If $x < 0$, which of the following functions is/are undefined using real numbers only?

Lessons 20, 36, and 37

$$f(x) = \frac{1}{x}$$

$$g(x) = \sqrt{x}$$

$$h(x) = \log x$$

$$k(x) = \frac{x}{2}$$

- A. f and g only
- B. f and h only
- C. g and h only
- D. g and k only
- E. h and k only

21. Given the function $P(t) = 100,000e^{0.022t}$, find the value of t when $P(t) = 140,000$. *Lesson 37*

- A. $t < 5$
- B. $5 < t < 10$
- C. $10 < t < 15$
- D. $15 < t < 20$
- E. $t > 20$

22. Express as one logarithm: *Lesson 38*

$$\log\left(\frac{x^2}{y^3}\right) - \log(xy) - 4\log\sqrt{y}$$

- A. $\log\left(\frac{x}{y^6}\right)$
- B. $\log\left(\frac{x}{y^2}\right)$
- C. $\log x^3$
- D. $\log\left(\frac{x}{y^8}\right)$
- E. $-4\log\left(\frac{x^2}{y^3} - xy - \sqrt{y}\right)$

23. Solve for x : *Lesson 39*

$$\log_3 \sqrt{2x + 3} = 2$$

- A. $x < 1$
- B. $1 < x < 5$
- C. $5 < x < 10$
- D. $10 < x < 20$
- E. $x > 20$

24. Solve for x : *Lesson 40*

$$2^{5-x} = 6$$

A. $x = \log_2(6) - 5$

B. $x = 5 - \log_6(2)$

C. $x = \frac{\log(2)}{\log(6)} - 5$

D. $x = 5 - \frac{\log(6)}{\log(2)}$

E. None of the above

25. The base of a triangle is three inches more than its height. If both the base and the height are increased by 3 inches the area is 14 square inches. Find the length of the original base (b) in inches. *Lesson 9*

A. $b = 1$

B. $b = \frac{7}{2}$

C. $b = 4$

D. $b = 8$

E. $b = 9$

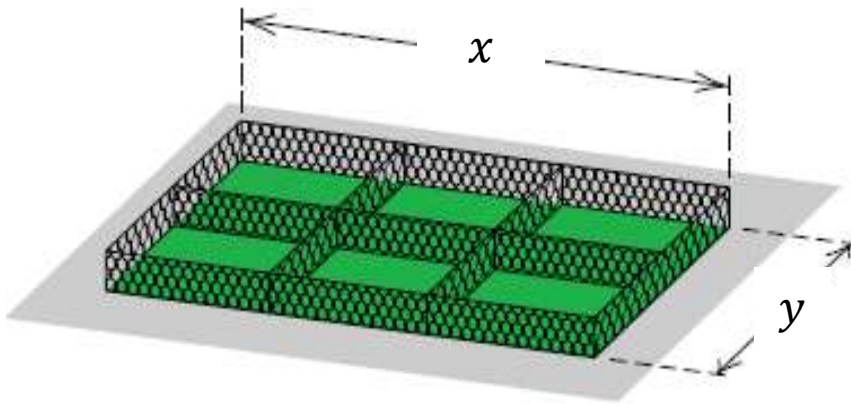
26. Temperature readings on the Fahrenheit and Celsius scales are related by the formula $F = \frac{9}{5}C + 32$.

Determine when the temperature reading on the Fahrenheit scale is twice the temperature reading on the Celsius scale. *Lesson 19*

A. When the Fahrenheit reading is less than 0° B. When the Fahrenheit reading is between 0° and 100° C. When the Fahrenheit reading is between 100° and 200° D. When the Fahrenheit reading is between 200° and 300° E. When the Fahrenheit reading is greater than 300°

27. Eight hundred feet of chain-link fence is to be used to construct six animal cages, as shown in the figure.

Find the value of x that maximizes the enclosed area. (hint: express y in terms of x first) *Lesson 26*



A. $x = \frac{3}{800}$

B. $x = \frac{400}{3}$

C. $x = \frac{800}{3}$

D. $x = 100$

E. $x = 200$

28. A woman has \$216,000 to invest and wants to generate \$12,000 per year in interest income. She can invest in two tax-free funds. The first is stable, but pays only an average 4.5% interest per year. The second pays an average of 9.25% interest per year, but has greater risk. If x represents the amount of money invested in the fund that averages 4.5% interest per year, which of the following best describes the value of x ? *Lesson 8 or Lesson 33*

A. x is less than \$50,000

B. x is between \$50,000 and \$60,000

C. x is between \$60,000 and \$70,000

D. x is between \$70,000 and \$80,000

E. x is more than \$80,000

29. Parents of a newborn baby are given a gift of \$10,000 and will choose between two options to invest for their child's college fund. Option 1 is to invest the gift in a fund that pays an average annual interest rate of 11% compounded quarterly; option 2 is to invest the gift in a fund that pays an average annual interest rate of 10.75% compounded continuously. Calculate the value of each investment using the formulas $A = Pe^{rt}$ and $A = P\left(1 + \frac{r}{n}\right)^{nt}$. Assume the investments have terms of 18 years and round your answers to the nearest dollar. *Lesson 35*

- A. Option 1 = \$69,240
Option 2 = \$70,517
- B. Option 1 = \$72,427
Option 2 = \$69,240
- C. Option 1 = \$70,517
Option 2 = \$69,240
- D. Option 1 = \$67,494
Option 2 = \$69,240
- E. Option 1 = \$67,494
Option 2 = \$72,427

30. A drug is eliminated from the body through urine. Suppose that for a dose of 10 milligrams, the amount $A(t)$ remaining in the body t hours later is given by $A(t) = 10(0.7)^t$. What is the half-life of the drug?
Lesson 40

- A. Between 0 and 0.5 hours
- B. Between 0.5 and 1 hour
- C. Between 1 and 1.5 hours
- D. Between 1.5 and 2 hours
- E. Between 2 and 2.5 hours