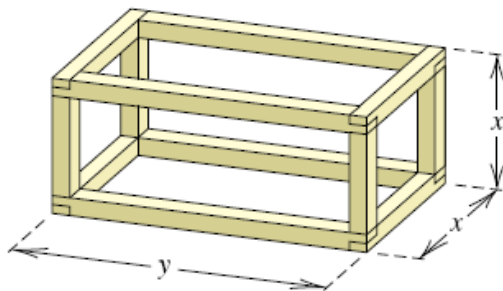


1. Find the remainder when $f(x)$ is divided by $p(x)$,

$$f(x) = 3x^3 - 5x^2 - 4x - 8 \qquad p(x) = x^2 + x$$

- A. $r(x) = -2x - 8$
B. $r(x) = -6x - 8$
C. $r(x) = 2x - 8$
D. $r(x) = 6x - 8$
E. $r(x) = 4x - 8$
2. The frame for a shipping crate is to be constructed from 32 feet of lumber. If the crate is to have square ends of sides x , for what values of x would the volume of the box be greater than zero?



- A. $(0, 4)$
B. $(0, \infty)$
C. $(0, 32)$
D. $(0, 8)$
E. $(0, 16)$
3. Find a polynomial $f(x)$ of degree 4 that has zeros at $x = -2$, $x = 1$, and $x = 3$ that satisfies the condition that $f(0) = 12$ and $f(x) < 0$ on $(-\infty, -2) \cup (3, \infty)$.
- A. $f(x) = 2(x + 2)(x - 1)(x - 3)$
B. $f(x) = -2(x + 2)(x - 1)^2(x - 3)$
C. $f(x) = (x + 2)^2(x - 1)(x - 3)$
D. $f(x) = -\frac{2}{3}(x + 2)(x - 1)(x - 3)^2$
E. $f(x) = -(x - 2)^2(x - 1)(x - 3)$

4. Find an equation of a rational function f that satisfies the given conditions.

vertical asymptotes: $x = -3, x = 1$

horizontal asymptote: $y = 0$

x -intercept: -1

$$f(0) = -\frac{1}{2}$$

hole at $x = 2$

- A. $f(x) = \frac{2(x+3)(x-1)(x-2)}{3(x+1)(x-2)}$
- B. $f(x) = \frac{3(x+1)(x-2)}{2(x+3)(x-1)(x-2)}$
- C. $f(x) = \frac{-2(x+3)(x-1)(x-2)}{(x+1)(x-2)}$
- D. $f(x) = \frac{-2(x+1)(x-2)}{(x+3)(x-1)(x-2)}$
- E. None of the above

5. Find the vertical asymptote(s) of the rational function $f(x) = \frac{x^2 + 4x + 4}{x^2 + 3x + 2}$.

- A. $x = -2$
- B. $x = -2, -1$
- C. $x = -2, x = 2$
- D. $x = -1$
- E. There are no vertical asymptotes

6. Over what interval(s) is the rational function $f(x) = \frac{x^2 + 4x - 5}{x^2 + 2x - 3}$ decreasing?

- A. $(-\infty, -3) \cup (-3, \infty)$
- B. $(-\infty, -3)$
- C. $(-3, \infty)$
- D. $(-\infty, -3) \cup (-3, 1) \cup (1, \infty)$
- E. $f(x)$ is never decreasing

7. Given $f(x) = \frac{2x-3}{3x+4}$, find the inverse function $f^{-1}(x)$.

A. $f^{-1}(x) = \frac{3x+4}{2x-3}$

B. $f^{-1}(x) = \frac{3-2x}{3x-4}$

C. $f^{-1}(x) = \frac{3x-3}{2x-4}$

D. $f^{-1}(x) = \frac{-3x-4}{-3-2x}$

E. $f^{-1}(x) = \frac{4x+3}{2-3x}$

8. Given $f(x) = \frac{3x+2}{x-5}$, find the range of the inverse function $f^{-1}(x)$.

A. $(-\infty, \infty)$

B. $(-\infty, 0) \cup (0, \infty)$

C. $(-\infty, 5) \cup (5, \infty)$

D. $(-\infty, 3) \cup (3, \infty)$

E. $(-\infty, -\frac{3}{2}) \cup (-\frac{3}{2}, \infty)$

9. The number of bacteria in a certain culture increased from 600 to 1800 between 7:00am and 9:00am. Assuming the growth is exponential, the number $f(t)$ of bacteria t hours after 7:00am is given by $f(t) = 600(3)^{t/2}$. Estimate the number of bacteria in the culture at 11:00am.

A. 3,600

B. 2,400

C. 48,600

D. 5,400

E. 7,200

10. How much money invested at a rate of 6.4% interest compounded continuously will amount to \$100,000 after 10 years?
- A. \$52,729.24
 - B. \$64,264.21
 - C. \$66,421.89
 - D. \$71,239.56
 - E. \$73,435.20
11. Solve the equation for x : $e^{3+\ln x} = 4$
- A. $x = \ln 4 - 3$
 - B. $x = e^4 - 3$
 - C. $x = 4e^{-3}$
 - D. $x = \ln\left(\frac{4}{3}\right)$
 - E. $x = \frac{1}{3} \ln 4$
12. Starting with q_0 milligrams of a radioactive substance, the amount q remaining after t years is given by the formula $q = q_0 (2)^{-t/20}$. Express t in terms of q and q_0 .
- A. $t = \log_2 \left(\frac{-20q}{q_0} \right)$
 - B. $t = -\frac{20}{q_0} \log_2 q$
 - C. $t = -20 \log_2 \left(\frac{q}{q_0} \right)$
 - D. $t = -\log_2 \left(\frac{q}{20q_0} \right)$
 - E. $t = -\frac{1}{20} \log_2 \left(\frac{q}{q_0} \right)$

13. Write the expression as one logarithm.

$$2 \ln xy^2 - 4 \ln \sqrt{xy} + 2 \ln x^2 y^3$$

- A. $\ln(x^4 y^8)$
- B. $\ln(x^8 y^{12})$
- C. $\ln\left(\frac{1}{x^4 y^4}\right)$
- D. $\ln(x^6 y^{22})$
- E. $\ln\left(\frac{x^4}{y^4}\right)$

14. Find the exact solution to the logarithmic equation.

$$\log(5x + 1) = 2 + \log(2x - 3)$$

- A. $x = \frac{301}{205}$
- B. $x = \frac{299}{205}$
- C. $x = \frac{301}{195}$
- D. $x = \frac{299}{195}$
- E. No solutions exist

15. Solve for x : $4^{1-2x} = \left(\frac{1}{8}\right)^x$

- A. $x = 1$
- B. $x = 2$
- C. $x = 3$
- D. $x = 4$
- E. $x = 5$

Answers:

1. E
2. A
3. B
4. B
5. D
6. D
7. E
8. C
9. D
10. A
11. C
12. C
13. A
14. C
15. B