

1. If \$2000 is invested at a rate of 4.5% per year compounded monthly, find the principal after 18 months.
- A. \$4,489.01
 - B. \$4,416.96
 - C. \$3,391.76
 - D. \$2,139.39
 - E. \$2,091.88

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

vertical asymptotes: $x = -2, x = 1$

horizontal asymptote: $y = 0$

x -intercept: -1

$f(-3) = -2$

hole at $x = 0$

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

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

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

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

E. None of the above

3. Find an exponential function of the form $f(x) = ba^{-x} + c$ that has a horizontal asymptote at $y = 32$, a y -intercept of 212, and passes through the point $P(2, 112)$.

A. $f(x) = 212 \left(\frac{3}{2}\right)^{-x} + 32$

B. $f(x) = 180 \left(\frac{3}{2}\right)^{-x} + 32$

C. $f(x) = 212 \left(\frac{2}{3}\right)^{-x} + 32$

D. $f(x) = 180 \left(\frac{2}{3}\right)^{-x} + 32$

E. None of the above

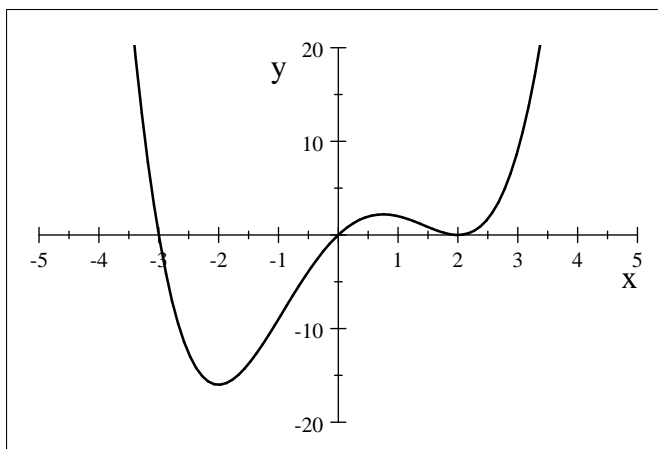
4. Find the quotient and remainder when $f(x) = x^4 - 3x^3 + 3x^2 - 18$ is divided by $p(x) = -2x^2 + 6$
- A. $q(x) = -\frac{1}{2}x^2 - \frac{3}{2}$; $r(x) = 9$
B. $q(x) = -\frac{1}{2}x^2 + \frac{3}{2}x - \frac{3}{2}$; $r(x) = 9x - 27$
C. $q(x) = -\frac{1}{2}x^2 + \frac{3}{2}x - \frac{3}{2}$; $r(x) = 9x - 9$
D. $q(x) = -\frac{1}{2}x^2 + \frac{1}{2}x + 3$; $r(x) = 9x + 18$
E. $q(x) = -\frac{1}{2}x^2 + \frac{3}{2}x - 3$; $r(x) = -9x$
5. If $f(x) = \sqrt{x^2 - 4}$, find the domain and range of $f^{-1}(x)$.
- A. $D = [-2, 2], R = [0, \infty)$
B. $D = [0, \infty), R = [-2, 2]$
C. $D = (-\infty, -2] \cup [2, \infty), R = [0, \infty)$
D. $D = [0, \infty), R = (-\infty, -2] \cup [2, \infty)$
E. $D = (-\infty, \infty), R = [-2, 2]$
6. The radioactive bismuth isotope ^{210}Bi has a half-life of 5 days. If there are 100 milligrams of ^{210}Bi present at $t = 0$, then the amount $f(t)$ remaining after t days is given by $f(t) = 100(2)^{-t/5}$. How many milligrams of ^{210}Bi will remain after 2 weeks?
- A. 75.79 milligrams
B. 0.01 milligrams
C. 25.00 milligrams
D. 18.65 milligrams
E. 14.35 milligrams
7. Find all zeros of $f(x) = x^3e^{-2x} + x^2e^{-2x} - 6xe^{-2x}$.
- A. $x = 0$
B. $x = 0, 6$
C. $x = -2, 0, 3$
D. $x = -3, 0, 2$
E. $f(x)$ is never zero

8. Which of the following polynomials could be represented by the graph shown?

I. $f(x) = x(x - 2)^2(x + 3)$

II. $f(x) = x^3(x - 2)^4(x + 3)$

III. $f(x) = x(x - 2)^2(x + 3)^3$



A. I

B. I and II

C. I and III

D. II and III

E. I, II, and III

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

A. $f(x)^{-1} = \frac{x + 3}{2 - 5x}$

B. $f(x)^{-1} = \frac{5x - 3}{2x + 1}$

C. $f^{-1}(x) = \frac{7x + 2}{-3x + 2}$

D. $f^{-1}(x) = \frac{5x + 1}{2x - 3}$

E. $f^{-1}(x) = \frac{3 - 2x}{-1 - 5x}$

10. Over what intervals is the graph of $f(x) = \frac{x^2 + 4x + 4}{x^2 + 3x + 2}$ decreasing?

A. $(-\infty, -1)$

B. $(-1, \infty)$

C. $(-\infty, -1) \cup (-1, \infty)$

D. $(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$

E. $(-\infty, -2) \cup (-2, \infty)$

11. A meteorologist determines the temperature T (in $^{\circ}\text{F}$) for a certain 24-hour period in winter was given by the formula $T = \frac{1}{20}t(t - 12)(t - 24)$ for $0 \leq t \leq 24$, where t is time in hours and $t = 0$ corresponds to 6:00am. During which of the following time intervals was the temperature continually above zero?
- A. 6:00am - 6:00pm
 - B. 12:00am (midnight) - 12:00pm (noon)
 - C. 12:00pm (noon) - 12:00am (midnight)
 - D. 6:00pm - 6:00am
 - E. None of the above
12. In 1980, the population of blue whales in the southern hemisphere was thought to number 4500. The population $N(t)$ has been decreasing according to the formula $N(t) = 4500e^{-0.1345t}$, where t is in years and $t = 0$ correspond to 1980. If this trend continues, predict the population in the year 2020.
- A. 598
 - B. 305
 - C. 156
 - D. 80
 - E. 21
13. If $\ln x = 2.5301$, estimate x to four decimal places.
- A. 0.9283
 - B. 0.4031
 - C. 0.2541
 - D. 12.5548
 - E. 15.2801
14. Solve the equation for x : $4^{2x-3} = \left(\frac{1}{8}\right)^{5-x}$
- A. $x = -\frac{8}{3}$
 - B. $x = -9$
 - C. $x = -8$
 - D. $x = -18$
 - E. No solution exists

15. The population density D (in people/mi²) in a large city is related to the distance (in miles) from the center of the city by $D = \frac{5000x}{x^2 + 36}$. What happens to the density as the distance increases from the center of the city?
- A. It constantly increases
 - B. It constantly decreases
 - C. It increases, and then decreases
 - D. It decreases, and then increases
 - E. It remains constant, then decreases
16. Solve the equation for x : $\log_2(x^2 + 4x) = 5$
- A. $x = -4, 8$
 - B. $x = -8, 4$
 - C. $x = 8$
 - D. $x = 4$
 - E. None of the above
17. Starting with q_0 milligrams of radium, the amount q remaining after t years is given by the formula $q = q_0(2)^{-t/1600}$. Express t in terms of q and q_0 .
- A. $t = \log_2 \left(\frac{q}{-1600q_0} \right)$
 - B. $t = \frac{\log_2 q}{-1600 \log_2 q_0}$
 - C. $t = \frac{-1600 \log_2 q}{\log_2 q_0}$
 - D. $t = -1600 \log_2 \left(\frac{q}{q_0} \right)$
 - E. $t = -\frac{1}{1600} \log_2 \left(\frac{q}{q_0} \right)$

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