

1. A cylindrical barrel with a radius of 2 feet is being filled with water at a rate of $5 \text{ ft}^3/\text{min}$. Which of the following is an equation for the height, h , of the water in the barrel as a function of time, t ? Assume that the barrel is initially empty.
 - A. $h(t) = \frac{5t}{2\pi}$
 - B. $h(t) = \frac{5t}{4\pi}$
 - C. $h(t) = \sqrt{\frac{5t}{2\pi}}$
 - D. $h(t) = \sqrt{\frac{5t}{4\pi}}$
 - E. $h(t) = \frac{5t}{8\pi}$

2. Find a polynomial $f(x)$ of degree 3 that has zeros at $x = -5, x = 2, x = 4$ and satisfies $f(3) = 24$.
 - A. $f(x) = -24(x + 5)(x - 2)(x - 4)$
 - B. $f(x) = 3(x + 5)(x - 2)(x - 4)$
 - C. $f(x) = -3(x + 5)(x - 2)(x - 4)$
 - D. $f(x) = 8(x + 5)(x - 2)(x - 4)$
 - E. $f(x) = \frac{1}{8}(x + 5)(x - 2)(x - 4)$

3. If a savings account pays an interest rate of 2.3% per year compounded quarterly has an initial investment of \$4000, how much money will be in the account after 7 years?
 - A. \$4,696.57
 - B. \$4,560.97
 - C. \$4,163.80
 - D. \$4,690.18
 - E. \$4,978.23

4. Find the intervals where the function $f(x) > 0$.

$$f(x) = 2(x+1)(x-3)(x-5)$$

- A. $(-\infty, -1) \cup (3, 5)$
 - B. $(-1, 3) \cup (5, \infty)$
 - C. $(-\infty, -1) \cup (5, \infty)$
 - D. $(-\infty, -1) \cup (-1, 3)$
 - E. $(-1, 3) \cup (3, 5)$
5. Find an equation of a rational function f that satisfies the given conditions.

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

horizontal asymptote: $y = 2$

x -intercepts: $-2, 1$

hole at $x = 0$

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

6. Under certain conditions the atmospheric pressure p (in inches) at an altitude of h feet is given by $p = 29e^{-.00034h}$. What is the pressure at an altitude of 30,000 feet?
- A. 0.00207 inches
 - B. 0.01058 inches
 - C. 0.00894 inches
 - D. 0.00108 inches
 - E. 0.01005 inches

7. Find the quotient, $q(x)$, and remainder, $r(x)$, if $f(x)$ is divided by $p(x)$.

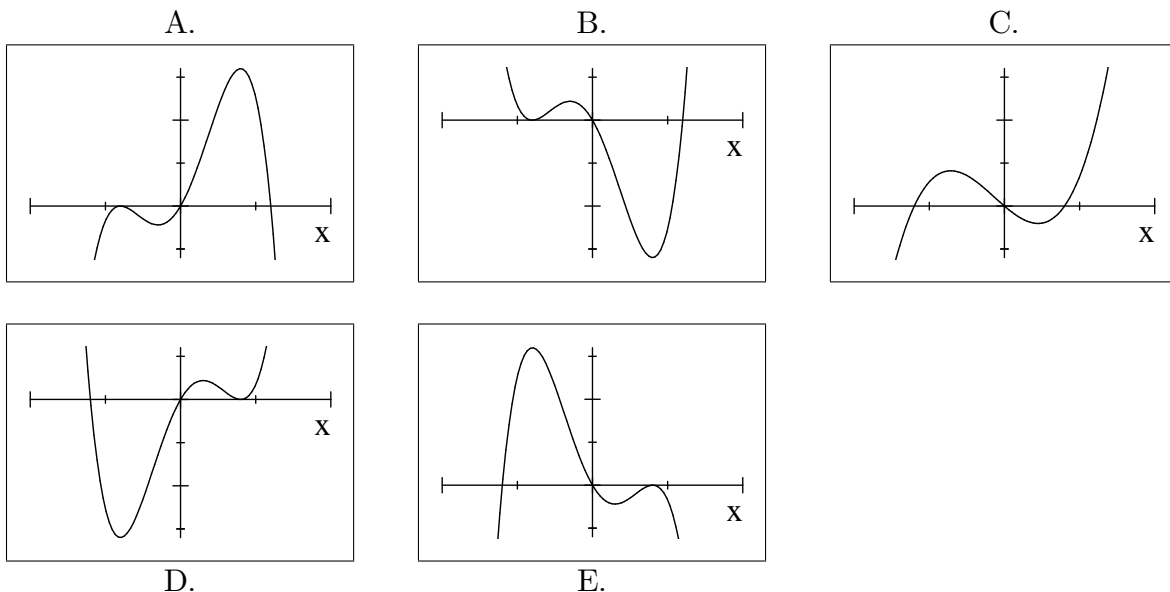
$$f(x) = x^4 + 3x^3 - 12 \qquad p(x) = x + 2$$

- A. $q(x) = x^3 + x^2 - 2x + 4; r(x) = -20$
 B. $q(x) = x^3 + x^2; r(x) = -14$
 C. $q(x) = x^3 + 5x^2 - 10x + 20; r(x) = -52$
 D. $q(x) = x^3 + 5x^2 + 10x - 20; r(x) = 28$
 E. $q(x) = x^3 + 2x^2; r(x) = -12$

8. Solve the equation: $\log_3(x - 4) = 2$

- A. 4
 B. 13
 C. 12
 D. 15
 E. 7

9. Which of the following could be the graph of $f(x) = -2x(x - 2)^2(x + 3)$?



10. Given $f(x) = \frac{x^2 + 2x - 3}{x^2 - x + 3}$, find the value of x at which the graph crosses the horizontal asymptote.
- A. 0
 - B. 1
 - C. 2
 - D. 3
 - E. it does not cross the horizontal asymptote

11. Find the inverse function of $f(x) = \frac{2x - 3}{5x + 2}$.

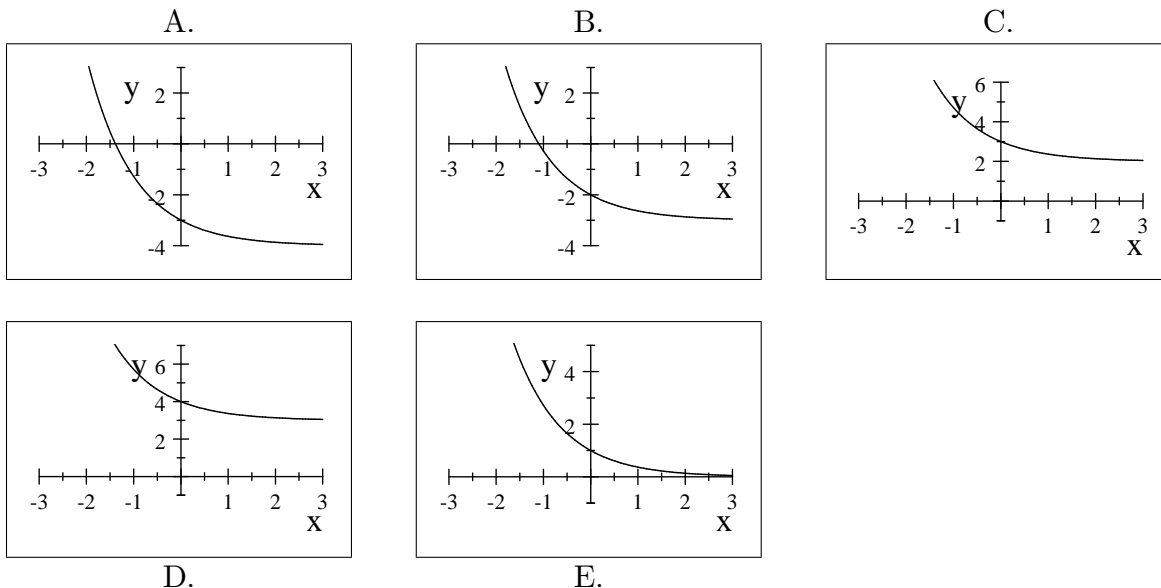
- A. $f^{-1}(x) = \frac{5x + 2}{2x - 3}$
- B. $f^{-1}(x) = \frac{3 - 2x}{-5x - 2}$
- C. $f^{-1}(x) = \frac{3 - 5x}{2 - 2x}$
- D. $f^{-1}(x) = \frac{5x + 3}{2x + 2}$
- E. $f^{-1}(x) = \frac{2x + 3}{2 - 5x}$

12. A scientist has limited data on the temperature T (in $^{\circ}\text{C}$) during a 24 hour period. If t denotes time in hours and $t = 0$ corresponds to midnight, find the third degree polynomial that fits the information in the following table.

t (hours)	0	4	10	18
T ($^{\circ}\text{C}$)	0	0	16	0

- A. $T(t) = -\frac{5}{192}t(t - 4)(t - 18)$
- B. $T(t) = -16t(t - 4)(t - 18)$
- C. $T(t) = -\frac{5}{8}t(t - 4)(t - 18)$
- D. $T(t) = -10t(t - 4)(t - 18)$
- E. $T(t) = -\frac{1}{30}t(t - 4)(t - 18)$

13. Which of the following could represent the graph of $f(x) = e^{-x} - 3$?



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

- A. $D = (-\infty, \infty); R = (-\infty, \infty)$
- B. $D = (-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty); R = (-\infty, 0) \cup (0, \infty)$
- C. $D = (-\infty, 0) \cup (0, \infty); R = (-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$
- D. $D = (-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty); R = (-\infty, \frac{5}{2}) \cup (\frac{5}{2}, \infty)$
- E. $D = (-\infty, \frac{5}{2}) \cup (\frac{5}{2}, \infty); R = (-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$
15. The radioactive bismuth isotope ^{210}Bi disintegrates according to $Q = k(2)^{-t/5}$, where k is a constant and t is the time in days. Express t in terms of Q and k .

- A. $t = -5 \log_2 \left(\frac{Q}{k} \right)$
- B. $t = \frac{-5 \log_2 Q}{k}$
- C. $t = 5 \log_2 \left(-\frac{Q}{k} \right)$
- D. $t = -5k \log_2 Q$
- E. $t = \log_2 \left(-\frac{5Q}{k} \right)$

Answers:

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