

1. Find a polynomial function of degree 3 whose zeros are -3 , 1 , and 3 .

A. $x^3 - x^2 - 9x + 9$

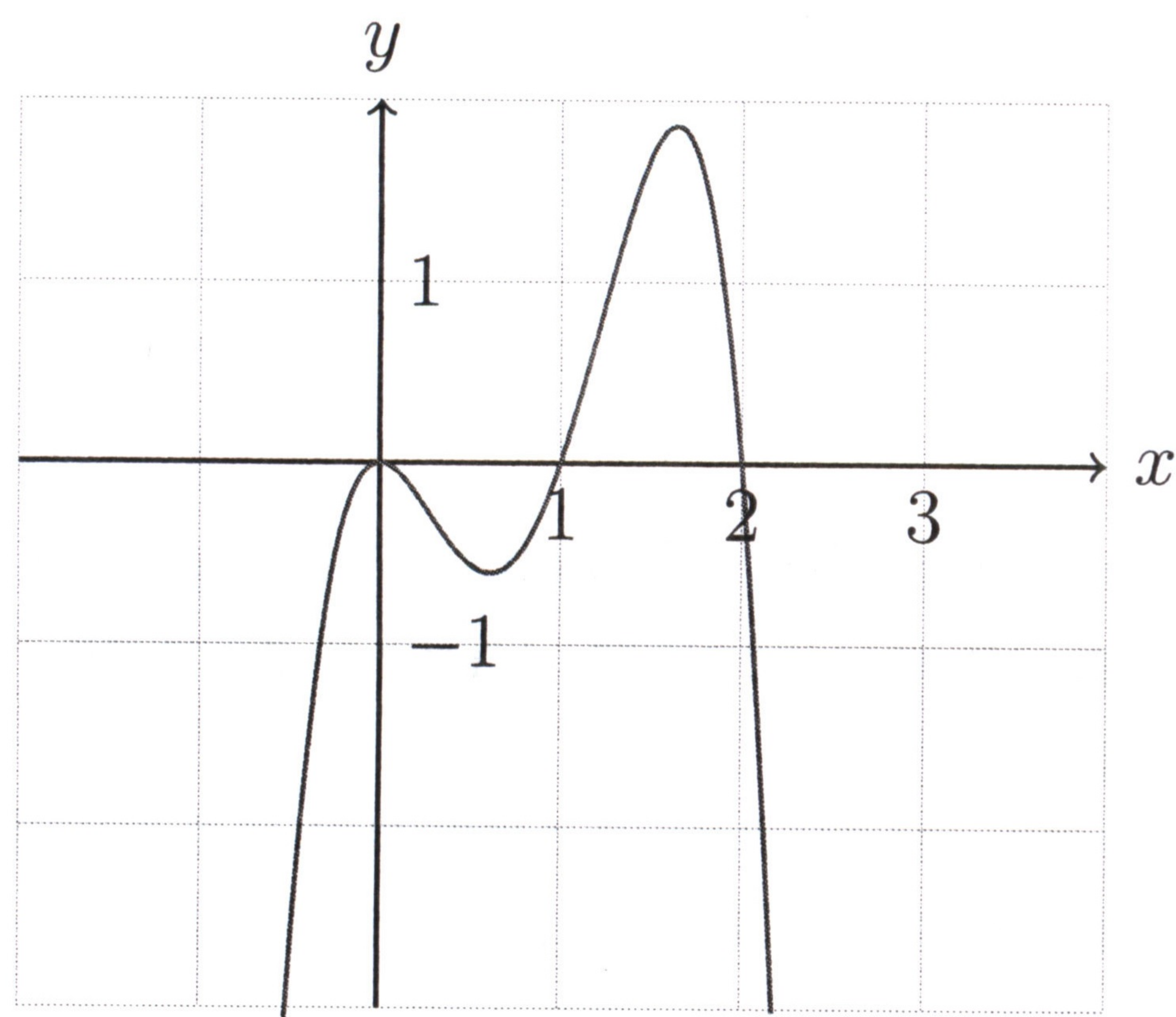
B. $x^3 + x^2 - 9x + 9$

C. $x^3 + x^2 - 9x - 9$

D. $x^3 - x^2 + 9x - 9$

E. $x^3 - x^2 + 9x + 9$

2. Select the polynomial function that represents the given graph.

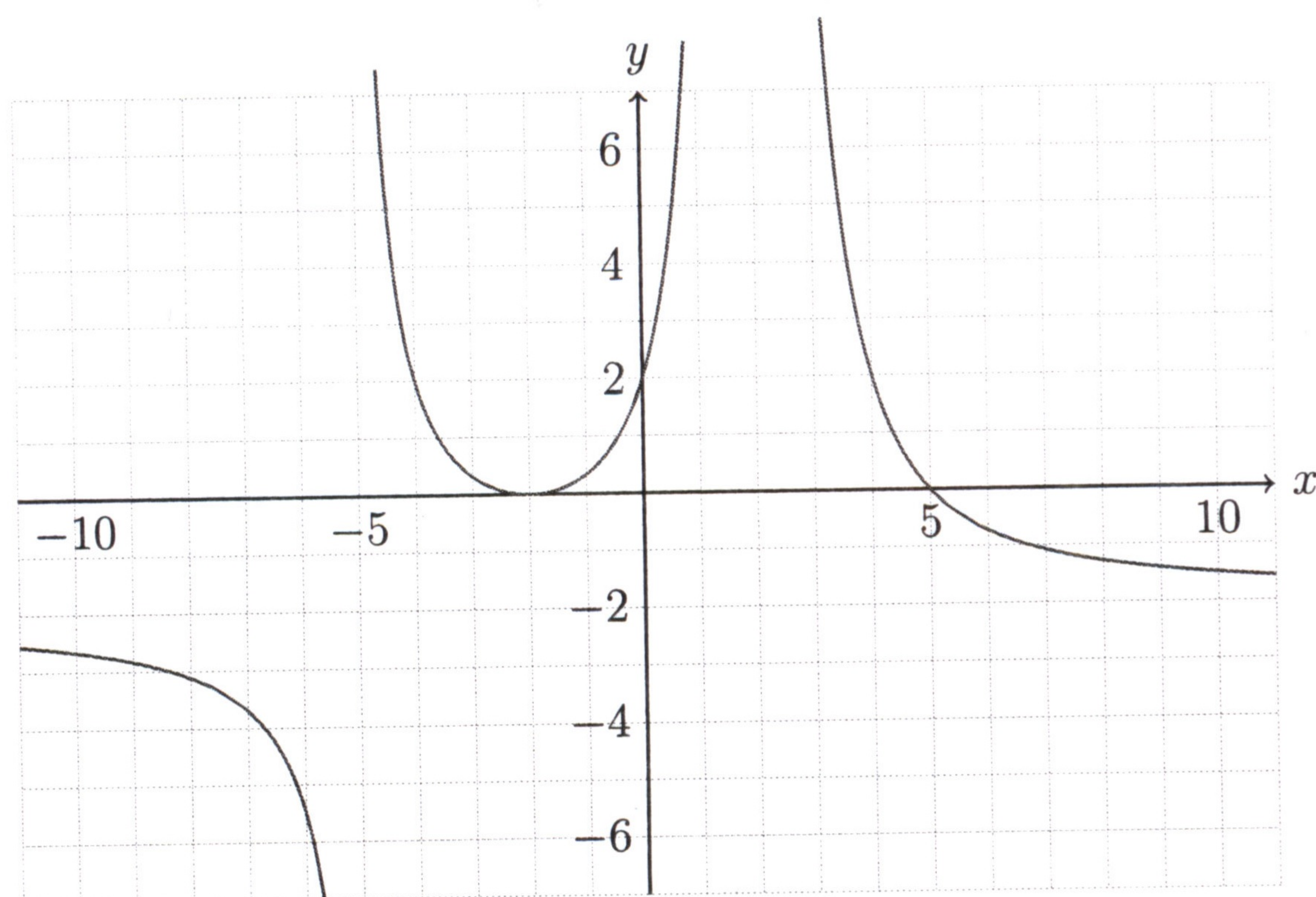


- A. $y = -3x^2(x+1)(x+2)$
- B. $y = -3x^2(x-1)^2(x-2)^2$
- C. $y = -3x^2(x-1)(x-2)$
- D. $y = 3x^2(x-1)(x-2)$
- E. $y = -3x(x-1)^2(x-2)$

3. Find the domain of the rational function $f(x) = \frac{7x^2 - 13x - 2}{2x(x+7)}$.

- A. $\{x \mid x \neq 0, x \neq -7\}$
- B. $\{x \mid x \neq -\frac{1}{2}, x \neq 2\}$
- C. $\{x \mid x \neq 0, x \neq 7\}$
- D. $\{x \mid x \neq \frac{1}{2}, x \neq -2\}$
- E. all real numbers

4. Find a rational function that has the following graph.



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

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

C. $y = \frac{(x+2)^2(x-5)}{(x+5)(x-2)^2}$

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

E. $y = \frac{2(x+2)^2(x-5)^2}{(x+5)(x-2)^2}$

5. Let $R(x) = \frac{2x^2 + 2x + 1}{x^2 + 1}$. Find all horizontal or oblique asymptotes if any.

A. $y = -1$

B. $y = 1$

C. $y = 0$

D. $y = 2$

E. no horizontal or oblique asymptotes

6. Let $R(x) = \frac{6x^5 + 4x^4 + 2}{2x^4 + 2x^3}$. Find all horizontal or oblique asymptotes if any.

A. $y = 3x - 1$

B. $y = 3x - 2$

C. $y = 3x + 2$

D. $y = 3x + 1$

E. no horizontal or oblique asymptotes

7. Find all vertical asymptotes of the rational function $R(x) = \frac{x^2 + 4x + 4}{x(x+2)(x-2)}$.
- A. $x = 0, x = 2$
 - B. $x = 0, x = -2$
 - C. $x = 0, x = 2, x = -2$
 - D. $x = 0$
 - E. $x = 2, x = -2$
8. Solve the inequality $(x+1)(x+2)(x+3) \leq 0$.
- A. $(-\infty, -3] \cup [-2, -1]$
 - B. $(-\infty, -3) \cup (-2, -1)$
 - C. $[-3, -1]$
 - D. $(-3, -2) \cup (-1, \infty)$
 - E. $[-3, -2] \cup [-1, \infty)$
9. Solve the inequality $x^4 + x^2 < 2x^2$.
- A. $(-1, 0) \cup (1, \infty)$
 - B. $(-1, 0) \cup (0, 1)$
 - C. $(-1, 1)$
 - D. $(-\infty, 0)$
 - E. $(-\infty, -1) \cup (1, \infty)$
10. Solve the inequality $\frac{(3+x)(2-x)}{x+3} > 0$.
- A. $(-\infty, -2) \cup (2, 3)$
 - B. $(-\infty, -3) \cup (2, \infty)$
 - C. $(-\infty, -3) \cup (2, 3)$
 - D. $(-3, 2) \cup (3, \infty)$
 - E. $(-3, 2) \cup (2, 3)$
 - F. $(-\infty, -3) \cup (3, \infty)$
11. Solve the inequality $\frac{2x-5}{x+2} \leq 1$.
- A. $[-2, 3]$
 - B. $(-\infty, -2) \cup [3, \infty)$
 - C. $[-2, 7]$
 - D. $(-\infty, -2) \cup [7, \infty)$
 - E. $(-2, 7]$
 - F. $(-2, 3]$

12. Let $f(x)$ be a polynomial so that $f(1) = -1$, $f(2) = 1$, $f(3) = 5$, $f(4) = -1$, and $f(5) = 1$. Then the intermediate value theorem promises that there must be how many zeros for $f(x)$, for x between 1 and 4?
- A. one
 - B. two
 - C. three
 - D. four
 - E. none
13. Use the factor theorem to determine if $x - 2$, $x + 2$ and $x - 1$ are factors of $x^{20} - 4x^{18} - x^3 + 8$. Choose the correct response.
- A. Both $x - 1$ and $x - 2$ are not factors and $x + 2$ is a factor.
 - B. Both $x + 2$ and $x - 2$ are factors and $x - 1$ is not a factor.
 - C. Both $x + 2$ and $x - 2$ are not factors and $x - 1$ is a factor.
 - D. Both $x + 2$ and $x - 1$ are not factors and $x - 2$ is a factor.
 - E. Both $x - 1$ and $x - 2$ are factors and $x + 2$ is not a factor.
 - F. Both $x + 2$ and $x - 1$ are factors and $x - 2$ is not a factor.
14. If $x^{25} - 25x^{23} + x - 3$ is divided by $x - 5$, then the remainder is
- A. 3.
 - B. -1.
 - C. 0.
 - D. 2.
 - E. 1.
15. Find k so the $x^4 - kx^3 + kx^2 + x - 2$ has the factor $x - 2$.
- A. $k = 3$
 - B. $k = -3$
 - C. $k = -2$
 - D. $k = 2$
 - E. $k = 4$
 - F. $k = -4$
16. The polynomial $4x^4 + 8x^3 + 3x^2 - 2x - 1$ has four rational zeros. Find the zero that has multiplicity two.
- A. $1/2$
 - B. 2
 - C. $-1/2$
 - D. -1
 - E. -2
 - F. 1

17. Form a polynomial of degree 4 whose zeros are $1, -1, 1 + i$, and $1 - i$.

- A. $x^4 - 2x^2 - 1$
- B. $x^4 + 2x^2 - 1$
- C. $x^4 - x^3 + x^2 - x + 1$
- D. $x^4 - 1$
- E. $x^4 - 2x^3 + x^2 + 2x - 2$

18. Find a quadratic polynomial with real coefficients so that $1 + i$ is a zero.

- A. $x^2 - 2x + 2$
- B. $x^2 + 2x + 2$
- C. $x^2 + 2x - 2$
- D. $x^2 - 2x - 2$
- E. $x^2 - 4x + 2$

19. Find all solutions to $x^4 - 2x^3 + 6x^2 - 2x + 5 = 0$, given that $x = i$ is a solution.

- A. $\pm i, 2 \pm i$
- B. $\pm i, \pm 2i$
- C. $\pm i, 2 \pm 3i$
- D. $\pm i, 1 \pm 2i$
- E. $\pm i, -1 \pm 2i$

20. Find all solutions to $2x^3 - 9x^2 + 14x - 5 = 0$.

- A. $1, \frac{1}{2} + i, \frac{1}{2} - i$
- B. $\frac{5}{2}, 2 + i, 2 - i$
- C. $-\frac{5}{2}, -2 + i, -2 - i$
- D. $-\frac{1}{2}, -2 + i, -2 - i$
- E. $\frac{1}{2}, 2 + i, 2 - i$