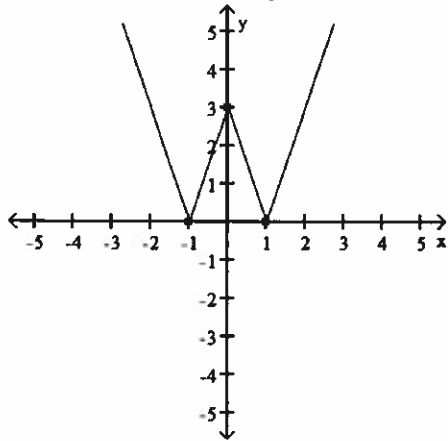


Precalculus: Semester 1 Final Exam Review

The graph of a function f is given. Use the graph to answer the question.

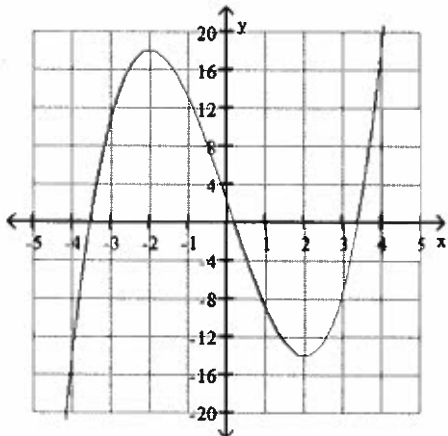
1) Find the numbers, if any, at which f has a relative maximum. What are the relative maxima?



- A) f has a relative maximum at $x = 1$; the relative maximum is 3
- B) f has a relative maximum at $x = 0$; the relative maximum is 3
- C) f has a relative maximum at $x = -1$ and 1; the relative maximum is 0
- D) f has no relative maximum

Use the graph of the given function to find any relative maxima and relative minima.

2) $f(x) = x^3 - 12x + 2$



- A) minimum: (2, -14); maximum: (-2, 18)
- B) maximum: (-2, 18) and (0, 0); minimum: (2, -14)
- C) no maximum or minimum
- D) maximum: (2, -14); minimum: (-2, 18)

Determine whether the given quadratic function has a minimum value or maximum value. Then find the coordinates of the minimum or maximum point.

3) $f(x) = x^2 - 2x - 8$

- A) maximum; (1, -9)
- B) minimum; (1, -9)
- C) maximum; (-9, 1)
- D) minimum; (-9, 1)

Find the coordinates of the vertex for the parabola defined by the given quadratic function.

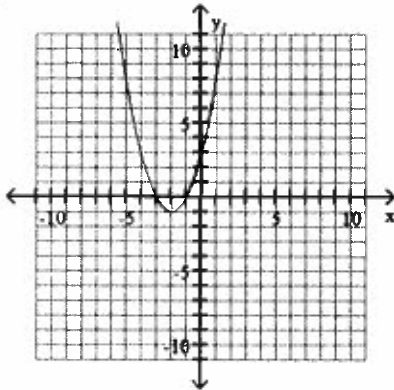
4) $f(x) = -x^2 - 14x - 1$

- A) (7, -50)
- B) (-14, -1)
- C) (-7, 48)
- D) (7, -148)

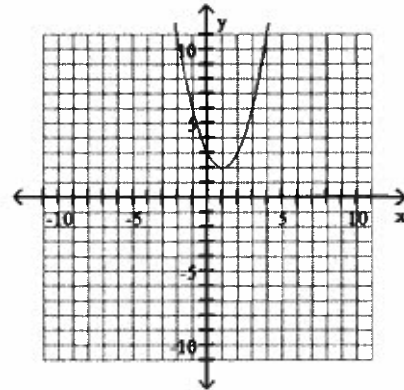
Use the vertex and intercepts to sketch the graph of the quadratic function.

$$5) y + 1 = (x + 2)^2$$

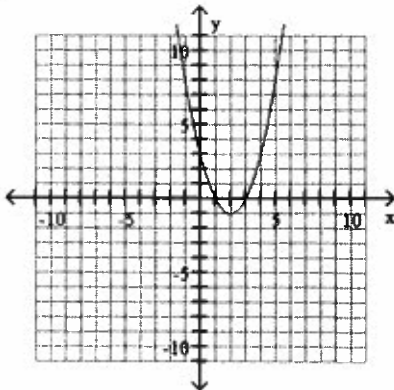
A)



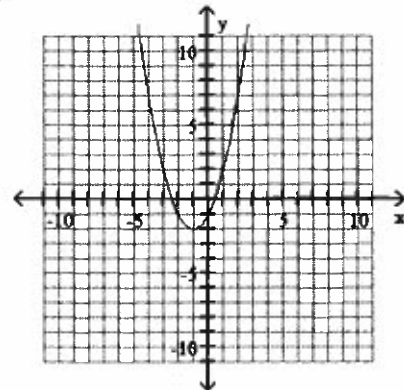
B)



C)



D)



Use the Leading Coefficient Test to determine the end behavior of the polynomial function.

$$6) f(x) = x^3 + 4x^2 + 3x - 3$$

A) rises to the left and rises to the right

C) rises to the left and falls to the right

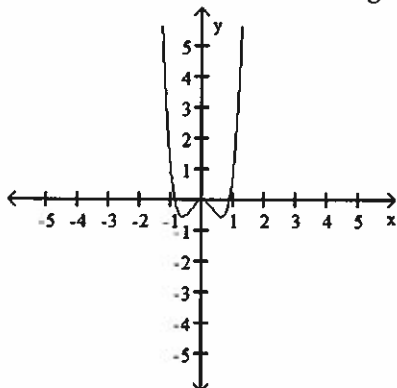
B) falls to the left and falls to the right

D) falls to the left and rises to the right

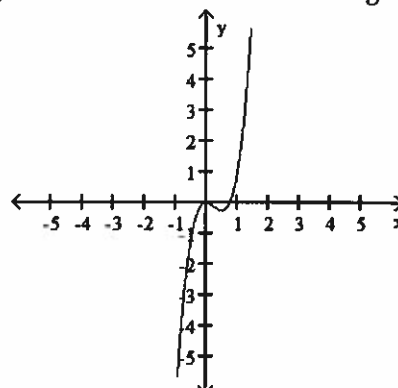
Use the Leading Coefficient Test to determine the end behavior of the polynomial function. Then use this end behavior to match the function with its graph.

7) $f(x) = 4x^4 - 3x^2$

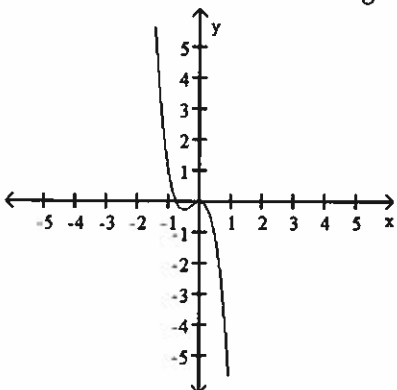
A) rises to the left and rises to the right



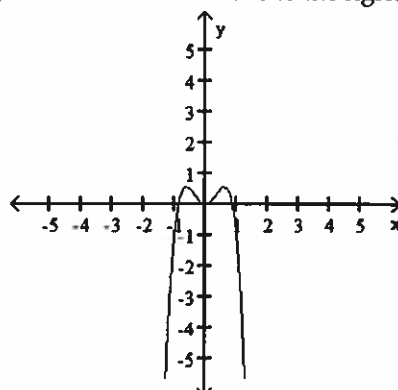
B) falls to the left and rises to the right



C) rises to the left and falls to the right



D) falls to the left and falls to the right



Find the zeros of the polynomial function.

8) $f(x) = x^3 + 6x^2 - x - 6$

A) $x = -6, x = 6$

C) $x = -1, x = 1, x = -6$

B) $x = 1, x = -6, x = 6$

D) $x = 36$

Find the zeros for the polynomial function and give the multiplicity for each zero. State whether the graph crosses the x-axis or touches the x-axis and turns around, at each zero.

9) $f(x) = 5(x - 7)(x + 3)^2$

A) 7, multiplicity 1, crosses x-axis; -3, multiplicity 2, touches x-axis and turns around

B) -7, multiplicity 1, touches x-axis and turns around; 3, multiplicity 2, crosses x-axis

C) 7, multiplicity 1, touches x-axis and turns around; -3, multiplicity 2, crosses x-axis

D) -7, multiplicity 1, crosses x-axis; 3, multiplicity 2, touches x-axis and turns around

Use the Intermediate Value Theorem to determine whether the polynomial function has a real zero between the given integers.

10) $f(x) = 8x^3 + 10x + 2$; between -1 and 0

A) $f(-1) = 16$ and $f(0) = -2$; yes

C) $f(-1) = -16$ and $f(0) = -2$; no

B) $f(-1) = 16$ and $f(0) = 2$; no

D) $f(-1) = -16$ and $f(0) = 2$; yes

11) $f(x) = 4x^3 - 3x^2 - 10x + 4$; between -2 and -1

A) $f(-2) = 20$ and $f(-1) = -7$; yes

C) $f(-2) = 20$ and $f(-1) = 7$; no

B) $f(-2) = -20$ and $f(-1) = 7$; yes

D) $f(-2) = -20$ and $f(-1) = -7$; no

Divide using synthetic division.

12) $\frac{x^4 - 3x^3 + x^2 + 6x - 7}{x - 1}$

A) $x^3 - 2x^2 + x + 7 + \frac{4}{x - 1}$

C) $x^3 - 2x^2 - x + 5 + \frac{2}{x - 1}$

B) $x^3 + 2x^2 - x + 7 - \frac{2}{x - 1}$

D) $x^3 - 2x^2 + x + 5 + \frac{4}{x - 1}$

Use the Rational Zero Theorem to list all possible rational zeros for the given function.

13) $f(x) = x^4 + 7x^3 - 4x^2 + 6x - 12$

A) $\pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{4}, \pm \frac{1}{6}, \pm \frac{1}{12}, \pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

B) $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{4}, \pm \frac{1}{6}, \pm \frac{1}{12}$

C) $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

D) $\pm \frac{1}{12}, \pm 1, \pm 12$

Use Descartes's Rule of Signs to determine the possible number of positive and negative real zeros for the given function.

14) $f(x) = -4x^9 + x^7 - x^2 + 6$

A) 3 or 1 positive zeros, 2 or 0 negative zeros

C) 3 or 1 positive zeros, 3 or 1 negative zeros

B) 2 or 0 positive zeros, 2 or 0 negative zeros

D) 2 or 0 positive zeros, 3 or 1 negative zeros

Find an nth degree polynomial function with real coefficients satisfying the given conditions.

15) $n = 3$; 3 and i are zeros; $f(2) = 20$

A) $f(x) = -4x^3 + 12x^2 - 4x + 12$

C) $f(x) = 4x^3 - 12x^2 + 4x - 12$

B) $f(x) = 4x^3 - 12x^2 - 4x + 12$

D) $f(x) = -4x^3 + 12x^2 + 4x - 12$

16) $n = 3$; 1 and $-2 + 3i$ are zeros; leading coefficient is 1

A) $f(x) = x^3 + 3x^2 + 9x - 13$

C) $f(x) = x^3 + 3x^2 + 15x - 13$

B) $f(x) = x^3 + 5x^2 + 9x - 14$

D) $f(x) = x^3 - 4x^2 + 9x - 13$

17) $n = 4$; $2i$, 3, and -3 are zeros; leading coefficient is 1

A) $f(x) = x^4 + 4x^2 - 3x - 36$

C) $f(x) = x^4 - 5x^2 - 36$

B) $f(x) = x^4 + 4x^2 - 36$

D) $f(x) = x^4 + 4x^3 - 5x^2 - 36$

Find the vertical asymptotes, if any, of the graph of the rational function.

18) $h(x) = \frac{x}{x - 1}$

A) $x = 0$ and $x = 1$

C) $x = 1$

B) $x = 0$ and $x = -1$

D) no vertical asymptote

Find the horizontal asymptote, if any, of the graph of the rational function.

$$19) f(x) = \frac{9x}{3x^2 + 1}$$

A) $y = 3$

B) $y = \frac{1}{3}$

C) $y = 0$

D) no horizontal asymptote

Find the slant asymptote, if any, of the graph of the rational function.

$$20) f(x) = \frac{x^2 - 6x + 3}{x + 8}$$

A) $y = x + 9$

B) $x = y + 6$

C) $y = x - 14$

D) no slant asymptote

Find the domain of the rational function.

$$21) g(x) = \frac{x + 8}{x^2 - 36}$$

A) $\{x \mid x \neq -6, x \neq 6, x \neq -8\}$

B) $\{x \mid x \neq 0, x \neq 36\}$

C) $\{x \mid x \neq -6, x \neq 6\}$

D) all real numbers