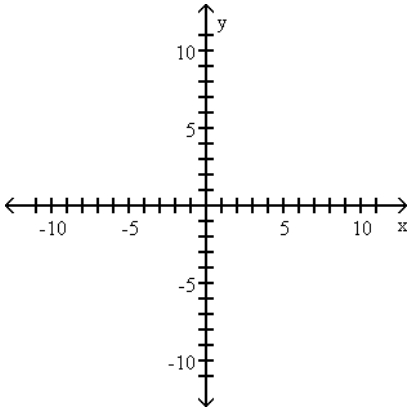
MIAMI DADE COLLEGE
INTERAMERICAN CAMPUS
DEPARTMENT OF MATHEMATICS
STUDY GUIDE
POLYNOMIAL AND RATIONAL FUNCTIONS

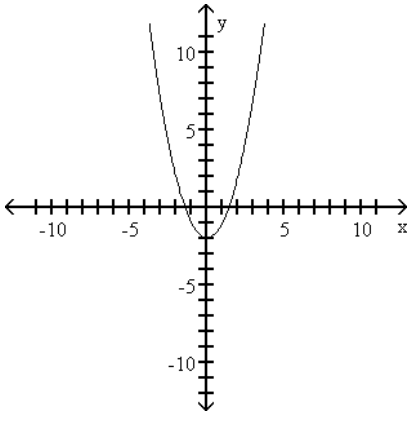
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph the function f by starting with the graph of $y = x^2$ and using transformations (shifting, compressing, stretching, and/or reflection).

1) $f(x) = x^2 - 2$ 1) _____



A)



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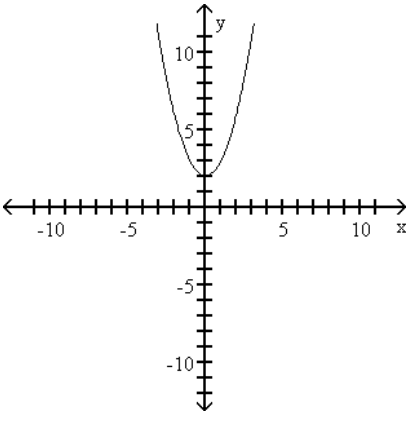

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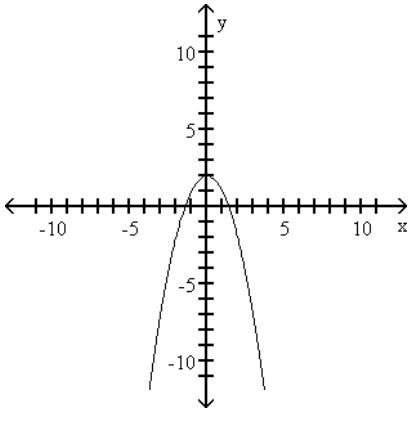

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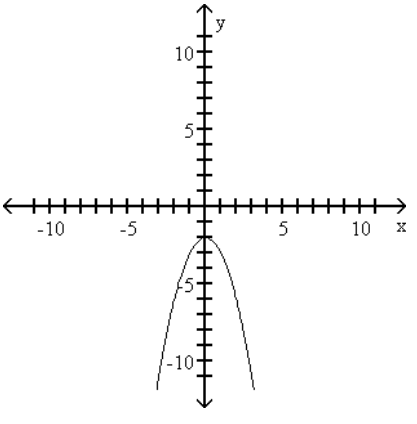
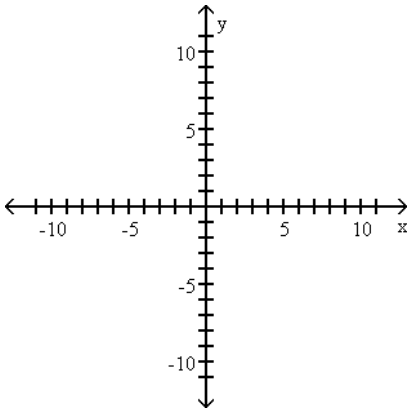
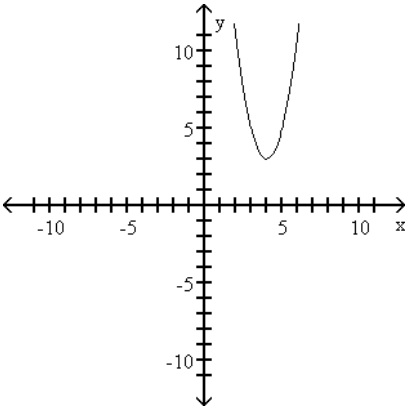


2) $f(x) = 2(x - 4)^2 - 3$ 2) _____



A)



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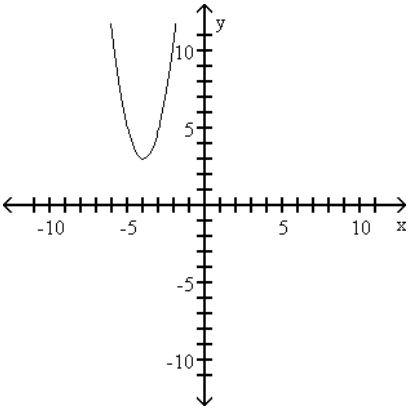

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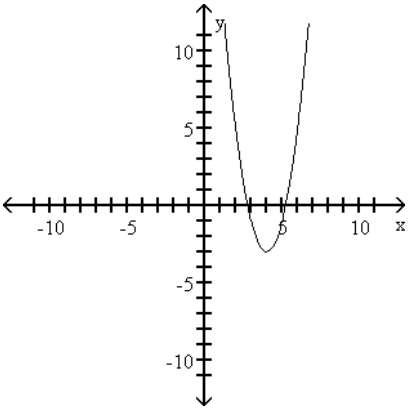

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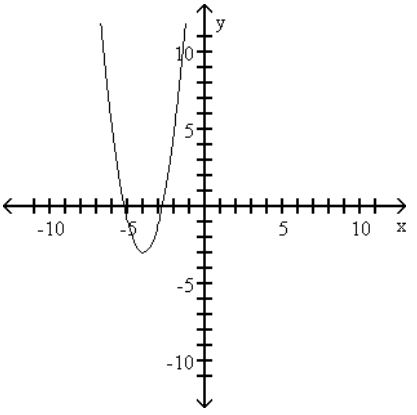


Find the vertex and axis of symmetry of the graph of the function.

3) $f(x) = x^2 - 10x + 20$ 3) _____

A) (-5, 0); x = -5 B) (0, -5); x = 0 C) (5, -5); x = 5 D) (5, 5); x = 5

Determine, without graphing, whether the given quadratic function has a maximum value or a minimum value and then find that value.

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

A) minimum; $-\frac{1}{2}$

B) maximum; $-\frac{39}{4}$

C) maximum; $-\frac{1}{2}$

D) minimum; $-\frac{39}{4}$

State whether the function is a polynomial function or not. If it is, give its degree. If it is not, tell why not.

5) $f(x) = -9x^4 - 5x^3 + 3$ 5) _____

A) No; the last term has no variable

B) Yes; degree 4

C) Yes; degree 8

D) Yes; degree 7

6) $f(x) = 1 + \frac{7}{x}$ 6) _____

A) Yes; degree 7

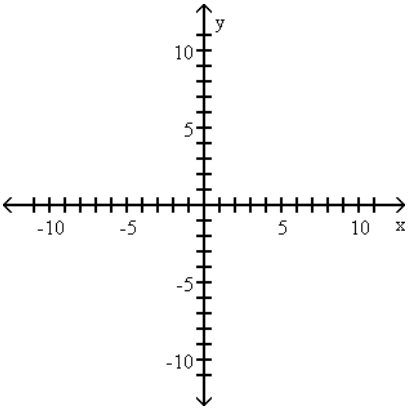
B) Yes; degree 0

C) Yes; degree 1

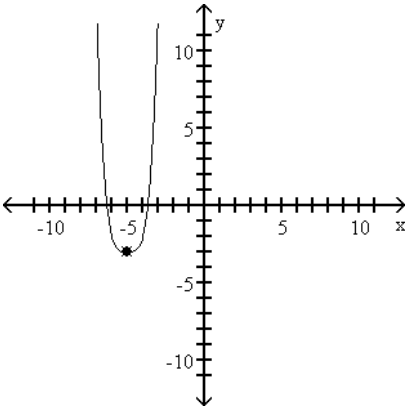
D) No; x is raised to a negative power

Use transformations of the graph of $y = x^4$ or $y = x^5$ to graph the function.

7) $f(x) = (x - 5)^4 + 3$ 7) _____



A)



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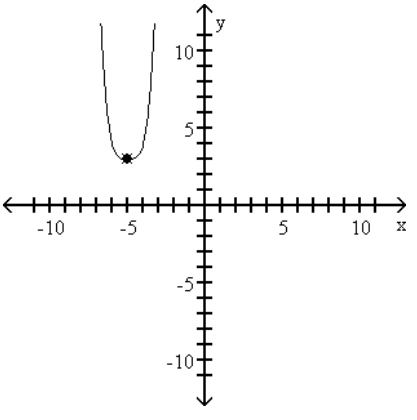

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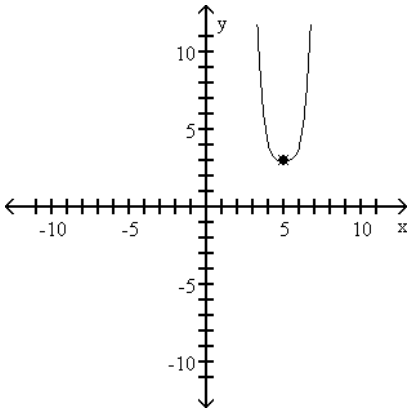

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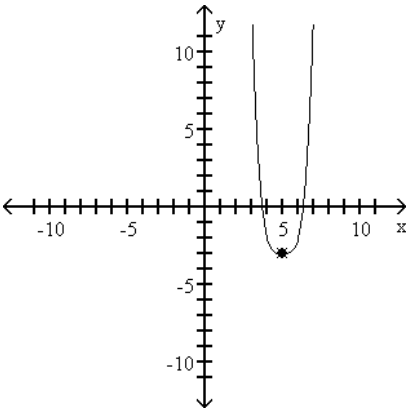
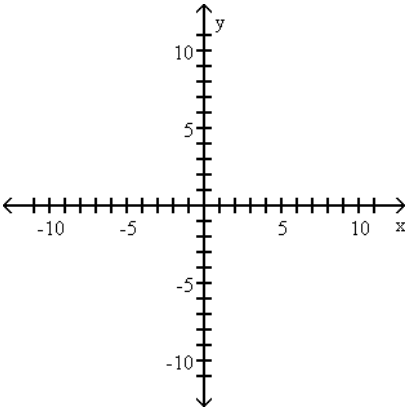
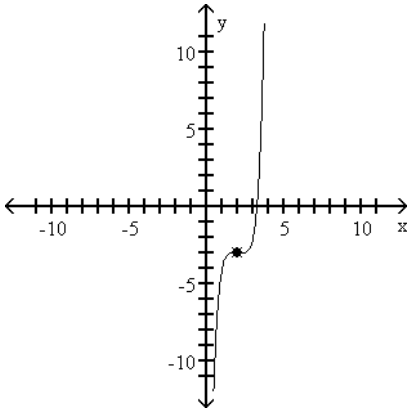


8) $f(x) = (x - 2)^5 + 3$ 8) _____



A)



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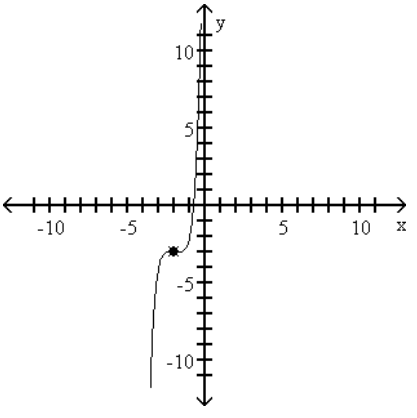

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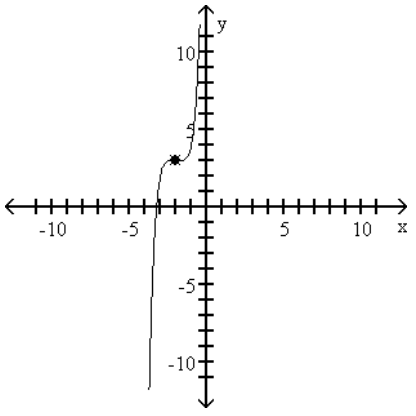
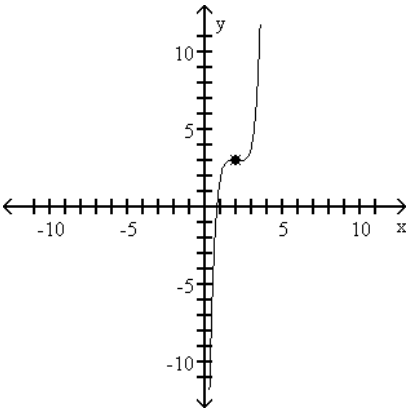


D)



Find the x- and y-intercepts of f.

9) $f(x) = (x + 1)(x - 8)(x - 1)^2$ 9) _____

A) x-intercepts: -1, 1, 8; y-intercept: -8
B) x-intercepts: -1, 1, -8; y-intercept: 8
C) x-intercepts: -1, 1, 8; y-intercept: 8
D) x-intercepts: -1, 1, -8; y-intercept: -8

Find the domain of the rational function.

10) $g(x) = \frac{5x}{x - 8}$ 10) _____

A) all real numbers
B) $\{x | x \neq 8\}$
C) $\{x | x \neq 0\}$
D) $\{x | x \neq -8\}$

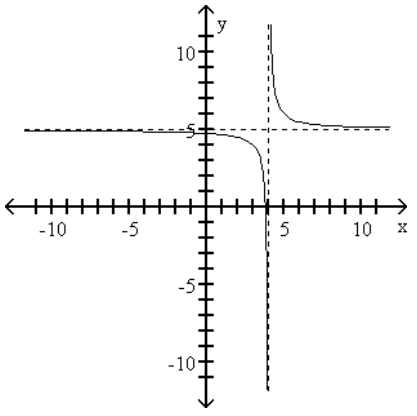
11) $h(x) = \frac{x + 3}{x^2 + 36}$ 11) _____

A) $\{x | x \neq -6, x \neq 6, x \neq -3\}$
B) $\{x | x \neq -6, x \neq 6\}$
C) $\{x | x \neq 0, x \neq -36\}$
D) all real numbers

12) $R(x) = \frac{x^2 + x - 20}{x^2 - 14x + 48}$. 12) _____

A) $\{x | x \neq -6, x \neq -8\}$
B) $\{x | x \neq 5, x \neq -4\}$
C) $\{x | x \neq 6, x \neq 8\}$
D) $\{x | x \neq -5, x \neq 4\}$

Use the graph to determine the domain and range of the function.

13) 

13) _____

A) domain: $\{x \mid x \neq 5\}$
range: $\{y \mid y \neq 4\}$

B) domain: $\{x \mid x \neq 4\}$
range: $\{y \mid y \neq 5\}$

C) domain: $\{x \mid x \neq 5\}$
range: $\{y \mid y \neq -4\}$

D) domain: $\{x \mid x \neq -4\}$
range: $\{y \mid y \neq 5\}$

Give the equation of the specified asymptote(s).

14) Vertical asymptote(s): $f(x) = \dfrac{3x - 7}{x^2 - 5x - 14}$

14) _____

A) $x = \dfrac{7}{3}$, $x = 7$, $x = -2$

B) $x = 7$, $x = -2$

C) $x = -7$, $x = 2$

D) no vertical asymptotes

15) Horizontal asymptote: $g(x) = \dfrac{x^2 + 2x - 4}{x - 4}$

15) _____

A) $y = 8$

B) $y = -2$

C) $y = 4$

D) no horizontal asymptotes

16) Horizontal asymptote: $h(x) = \dfrac{5x^2 - 6x - 9}{8x^2 - 7x + 8}$

16) _____

A) $y = \dfrac{5}{8}$

B) $y = \dfrac{6}{7}$

C) $y = 0$

D) no horizontal asymptotes

17) Oblique asymptote: $f(x) = \dfrac{x^2 + 2x - 4}{x - 4}$

17) _____

A) no oblique asymptotes

B) $y = x + 6$

C) $x = y + 6$

D) $y = x - 2$

18) Oblique asymptote: $f(x) = \frac{x^2 - 7x + 6}{x + 7}$ 18) _____

A) $x = y + 7$ B) $y = x - 14$
C) $y = x + 13$ D) no oblique asymptotes

Find the indicated intercept(s) of the graph of the function.

19) x-intercepts of $f(x) = \frac{x - 2}{x^2 + 7x - 2}$ 19) _____

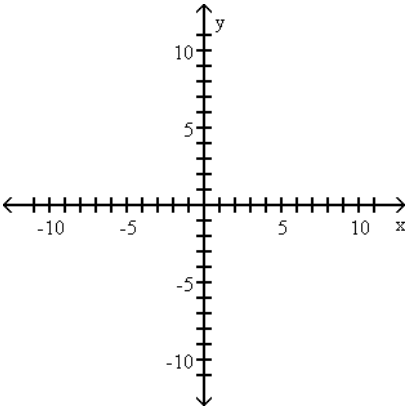
A) (1, 0) B) (7, 0) C) (2, 0) D) none

20) y-intercept of $f(x) = \frac{x - 8}{x^2 + 4x - 10}$ 20) _____

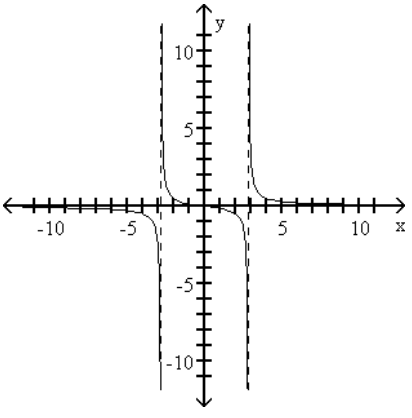
A) $(0, \frac{1}{2})$ B) (0, - 2) C) (0, 4) D) none

Graph the function.

21) $f(x) = \frac{x}{x^2 - 64}$ 21) _____



A)



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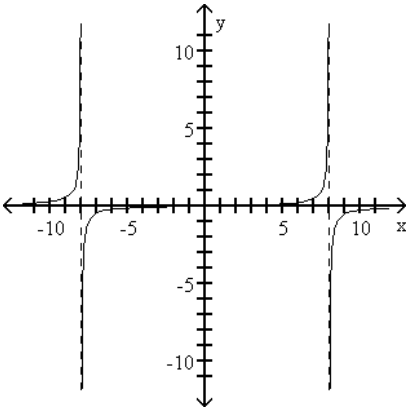

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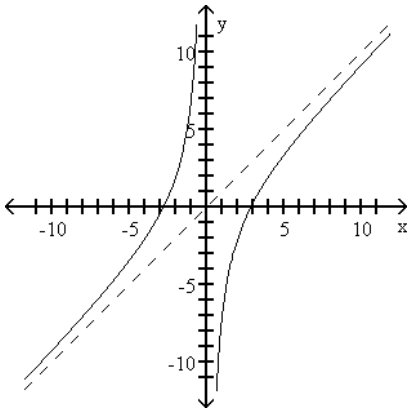

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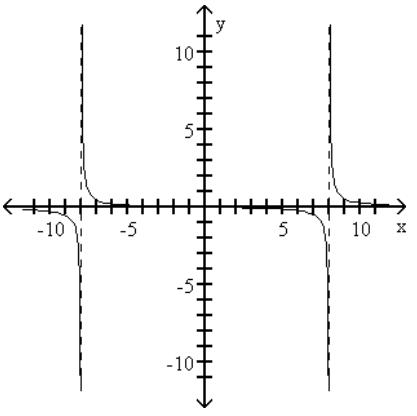

Solve the inequality.

22) $\frac{x - 7}{x + 6} < 0$ 22) _____

A) $(-\infty, -6)$ or $(7, \infty)$ B) $(7, \infty)$

C) $(-6, 7)$ D) $(-\infty, -6)$

Use the Factor Theorem to determine whether $x - c$ is a factor of $f(x)$.

23) $f(x) = x^3 + 4x^2 - 10x + 12$; $x + 6$ 23) _____

A) Yes B) No

Find the domain of the rational function.

24) $f(x) = \frac{x + 8}{x^2 + 16x}$ 24) _____

A) $\{x | x \neq -4, x \neq 4\}$ B) $\{x | x \neq -4, x \neq 4, x \neq -8\}$

C) $\{x | x \neq 0, x \neq -16\}$ D) all real numbers

List the potential rational zeros of the polynomial function. Do not find the zeros.

25) $f(x) = x^5 - 6x^2 + 6x + 7$ 25) _____

A) $\pm\frac{1}{6}, \pm\frac{7}{6}, \pm 7$ B) $\pm 1, \pm\frac{1}{7}$ C) $\pm 1, \pm 7$ D) $\pm 7, \pm\frac{1}{7}$

Find all of the real zeros of the polynomial function, then use the real zeros to factor f over the real numbers.

26) $f(x) = x^3 + 2x^2 - 9x - 18$ 26) _____

A) $-3, -2, 3$; $f(x) = (x + 3)(x + 2)(x - 3)$ B) $-3, 2, 3$; $f(x) = (x + 3)(x - 2)(x - 3)$

C) -2; $f(x) = (x + 2)(x^2 + x - 9)$ D) -3; $f(x) = (x + 3)(x^2 - x - 6)$

Solve the equation in the real number system.

27) $2x^3 - x^2 - 12x + 6 = 0$ 27) _____

A) $\{2, \sqrt{6}, -\sqrt{6}\}$ B) $\{-\frac{1}{2}, \sqrt{6}, -\sqrt{6}\}$

C) $\{\frac{1}{2}, \sqrt{6}, -\sqrt{6}\}$ D) $\{-2, \sqrt{6}, -\sqrt{6}\}$

Solve the problem.

28) One solution of $x^3 - 5x^2 + 5x - 1 = 0$ is 1. Find the other two solutions. 28) _____

A) $\{4 + \sqrt{3}, 4 - \sqrt{3}\}$ B) $\{2 + 2\sqrt{3}, 2 - 2\sqrt{3}\}$

C) $\{4 + 2\sqrt{3}, 4 - 2\sqrt{3}\}$ D) $\{2 + \sqrt{3}, 2 - \sqrt{3}\}$

Information is given about a polynomial f(x) whose coefficients are real numbers. Find the remaining zeros of f.

29) Degree 3; zeros: $2, 1 - i$ 29) _____

A) -2 B) $1 + i$ C) $-1 + i$ D) no other zeros

Use the given zero to find the remaining zeros of the function.

30) $f(x) = x^4 - 45x^2 - 196$; zero: $-2i$ 30) _____

A) $2i, 14i, -14i$ B) $2i, 7, -7$ C) $2i, 14, -14$ D) $2i, 7i, -7i$