

Name(s) _____

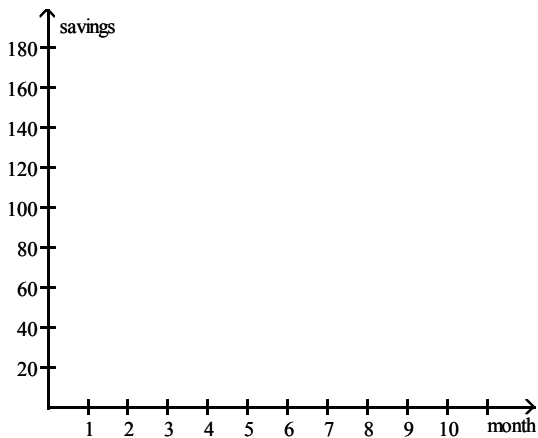
Solve the problem.

- 1) To convert a temperature from degrees Celsius to degrees Fahrenheit, you multiply the temperature in degrees Celsius by 1.8 and then add 32 to the result. Express F as a linear function of c .

- 2) The following data represents the amount of money Tom is saving each month since he graduated from college.

| month | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------|------|------|------|------|-------|-------|-------|
| savings | \$52 | \$70 | \$81 | \$91 | \$102 | \$118 | \$132 |

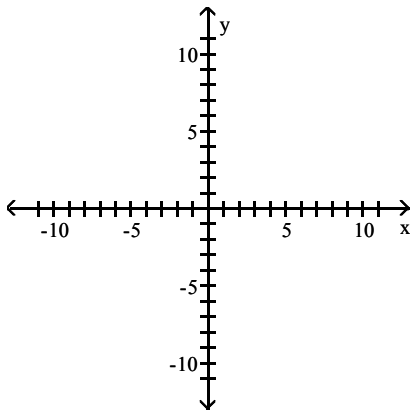
- a) Draw a scatter diagram of the data. b) Find the line of best fit using a Graphing Calculator. c) Give a short explanation on what the slope of the line of best fit represents in this situation. d) Using the line of best fit for the data set, predict the amount Tom may be able to save in the 24th month after graduating from college.



Graph the function f by finding the vertex, the axis of symmetry, the y -intercept and an additional point symmetric to the y intercept. Identify the x -intercepts if any.

3) $f(x) = x^2 + 6x + 5$

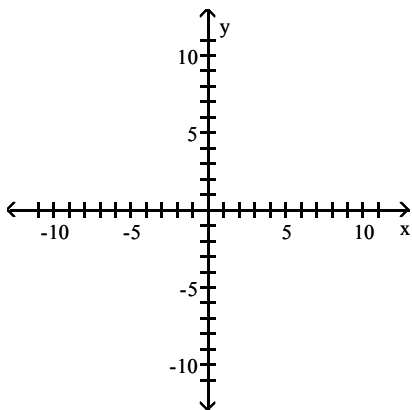
Vertex: (,)
 Equation of axis of symmetry:
 y -intercept: Point symmetric:
 x -intercepts:



Graph the function f by finding the vertex, the axis of symmetry, the y -intercept and an additional point symmetric to the y intercept. Identify the x -intercepts if any.

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

Vertex: (,)
 Equation of axis of symmetry:
 y -intercept: Point symmetric:
 x -intercepts:



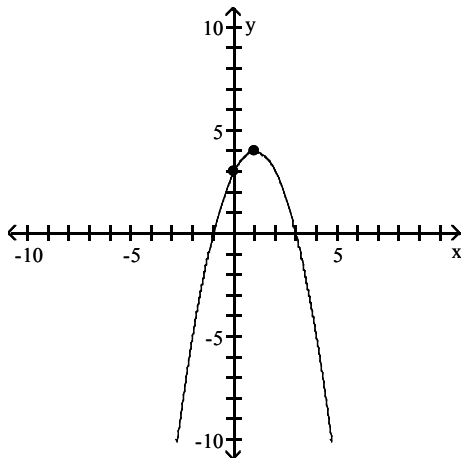
Determine, without graphing, whether the given quadratic function has a maximum value or a minimum value and then find that value.

5) $f(x) = 3x^2 - 2x - 6$

6) $f(x) = -11x^2 - 2x - 6$

Determine the quadratic function whose graph is given.

7)



Vertex: (1, 4)

y-intercept: (0, 3)

Solve the problem.

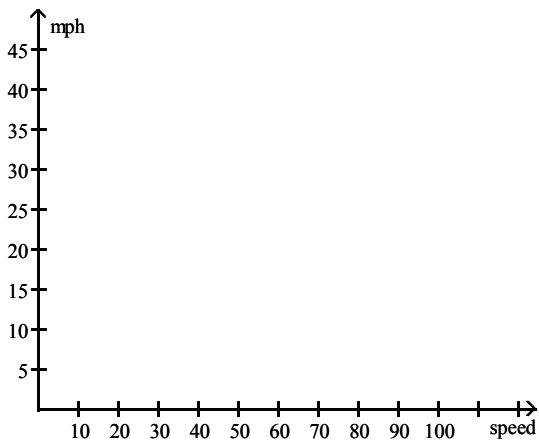
- 8) The manufacturer of a CD player has found that the revenue R (in dollars) is $R(p) = -5p^2 + 1050p$, when the unit price is p dollars. a) Find the price p that will maximize the revenue; b) what is the maximum revenue to the nearest whole dollar?
- 9) A projectile is thrown upward so that its distance above the ground after t seconds is $h = -11t^2 + 440t$. After how many seconds does it reach its maximum height? What is the maximum height?
- 10) A developer wants to enclose a rectangular grassy lot that borders a city street for parking. If the developer has 316 feet of fencing and does not fence the side along the street, what is the largest area that can be enclosed?

- 11) A coin is tossed upward from a balcony 218 feet high with an initial velocity of 32 feet per second. During what interval of time will the coin be at a height of at least 90 feet? ($h = -16t^2 + v_0t + h_0$.)
- 12) The revenue achieved by selling x graphing calculators is figured to be $x(32 - 0.2x)$ dollars. The cost of each calculator is \$24. How many graphing calculators must be sold to make a profit (revenue - cost) of at least \$51.20?

Use a graphing calculator to plot the data and find the quadratic function of best fit.

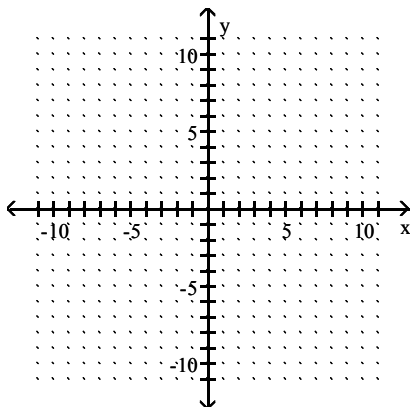
- 13) An engineer collects data showing the speed s of a given car model and its average miles per gallon M . Use a graphing calculator to plot the scatter diagram and draw the scatter diagram manually. What is the quadratic function of best fit?

| Speed, s | mph, M |
|------------|----------|
| 20 | 18 |
| 30 | 20 |
| 40 | 23 |
| 50 | 25 |
| 60 | 28 |
| 70 | 24 |
| 80 | 22 |



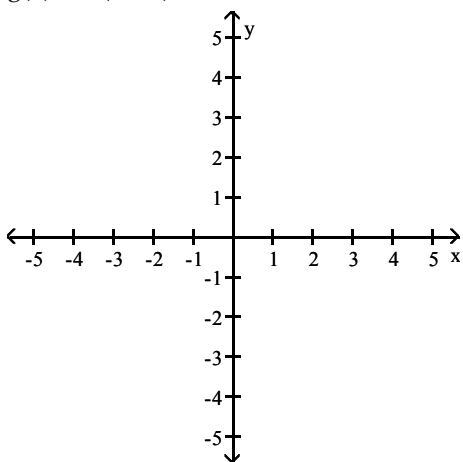
Graph the function using transformations of the graph of $y = x^3$. Indicate the new coordinates of 3 key points of the basic function.

14) $f(x) = x^3 - 5$



Use transformations of the graph of $y = x^4$ to sketch the graph of the function. Indicate the new coordinates of the 3 key points used to graph $y = x^4$.

15) $g(x) = -(x + 2)^4 - 3$



For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept.

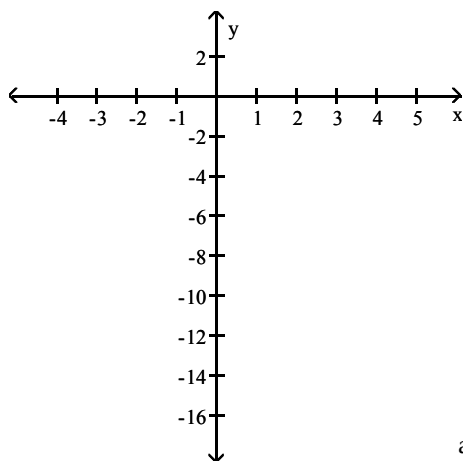
16) $f(x) = 3(x - 5)(x + 3)^4$

Form a polynomial function whose zeros and degrees are given. Use $a = 1$. Leave the answer in factored form.

17) Zeros: -3, multiplicity 2; 1, multiplicity 1; 5, multiplicity 3; degree = 6

18) For the function $f(x) = (x-1)^2(x+2)(x-3)$

- Find the zeros of the function, and indicate their multiplicity.
- Indicate the degree of the polynomial function and identify the power function it resembles for large $|x|$.
- Find the y-intercept.
- Sketch the graph of the function, use a graphing utility to find the coordinates of the relative maxima and minima.
- How many turning points does the graph have. Give the coordinates of the turning points, and indicate the intervals where the function is increasing or decreasing.



- Zeros and multiplicities:
- Degree:
Resembles $y = \underline{\hspace{2cm}}$ for large $|x|$

c) y-intercept: $\underline{\hspace{2cm}}$

d) Relative maximum :
Relative minima (2 decimal places):

e) # of turning points: $\underline{\hspace{1cm}}$ Coordinates of turning points: $\underline{\hspace{4cm}}$

f) Decreasing on: $\underline{\hspace{4cm}}$

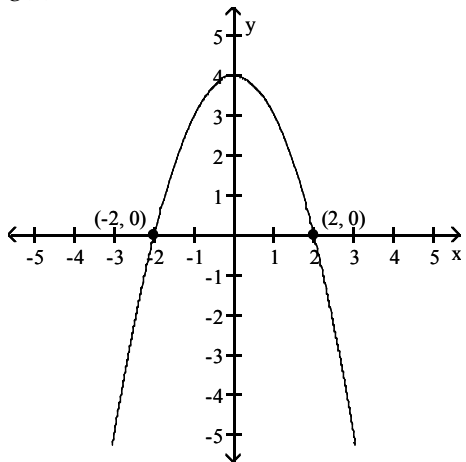
Increasing on: $\underline{\hspace{4cm}}$

Construct a polynomial function with the given properties.

19) The graph of the polynomial function crosses the x-axis at -2 and 3, touches the x-axis at 5, crosses the y-axis at -5 and is below the x-axis between -2 and 3.

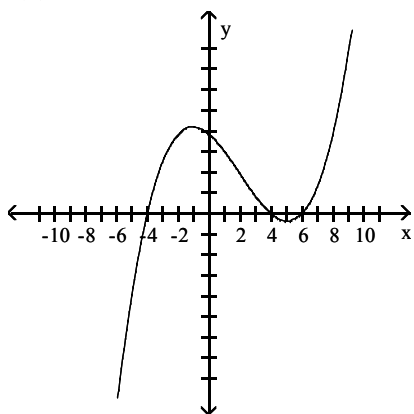
Use the figure to solve the inequality.

20) $g(x) \leq 0$



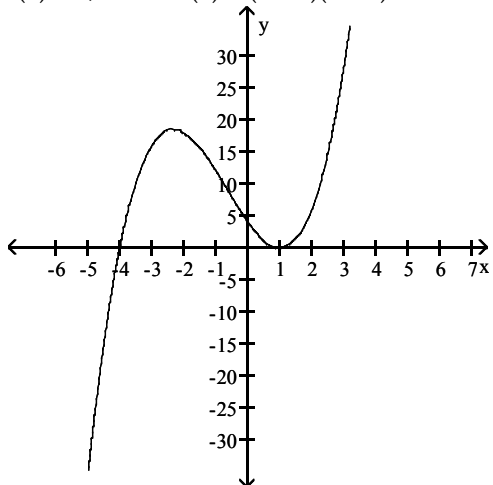
Use the graph of the function f to solve the inequality.

21) $f(x) \geq 0$



Solve the inequality by using the graph of the function.

22) $f(x) > 0$, where $f(x) = (x + 4)(x - 1)^2$.

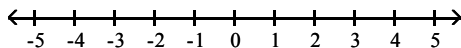


Solve the inequality. Graph the solution on a number line and write the answer in interval notation.

23) $(a + 6)(a - 4)(a - 7) > 0$

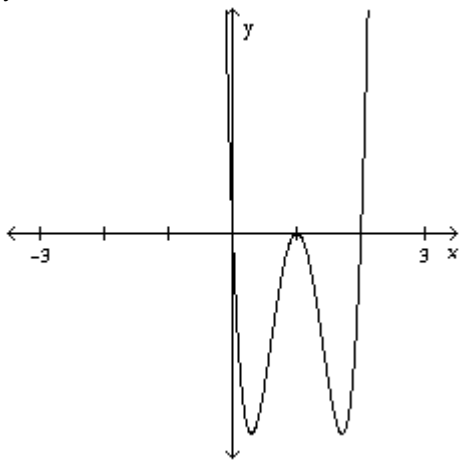
Solve the inequality, then graph its solution. Use interval notation.

24) $\frac{(x - 1)(3 - x)}{x - 2} \leq 0$



Answer the question.

25) Which of the following polynomial functions might have the graph shown in the illustration below? Explain your answer.



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

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

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

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

Give the equation of the specified asymptote(s).

26) Vertical and Horizontal asymptote(s): $f(x) = \frac{x - 8}{x^2 - 16}$, and indicate the domain of $f(x)$.

Equation of Vertical asymptote(s):

Domain of $f(x)$:

Equation of Horizontal asymptote:

27) Horizontal asymptote: $h(x) = \frac{8x^2 - 5x - 2}{4x^2 - 6x + 2}$

Equation of Horizontal asymptote:

Graph the function. Find the x and the y -intercepts (if any), the equations of the vertical and horizontal asymptotes and some key additional points to sketch the graph of the function.

28) $f(x) = \frac{3x + 4}{x + 5}$

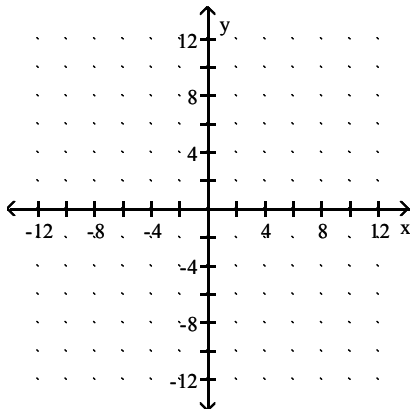
x -intercept:

y -intercept:

Equation of vertical asymptote:

Equation of horizontal asymptote:

Additional Points:



29) Graph the following function using vertical and horizontal translations of the graph of $y = \frac{1}{x}$. Find the equations of the vertical and horizontal asymptote of the new function.

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

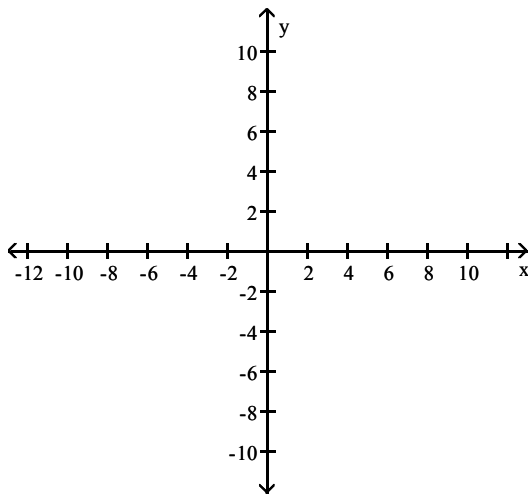
Vertical asymptote:

Horizontal asymptote:

x-intercept:

y-intercept:

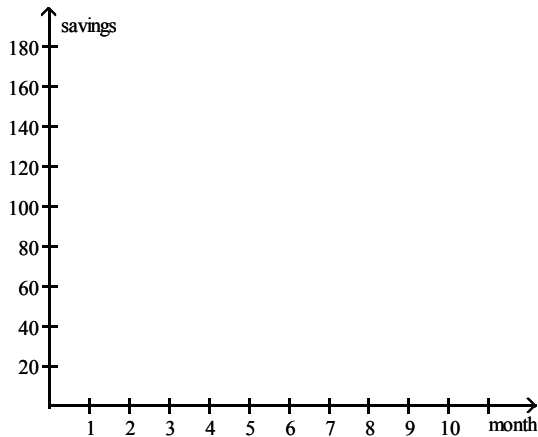
Additional points:



Answer Key

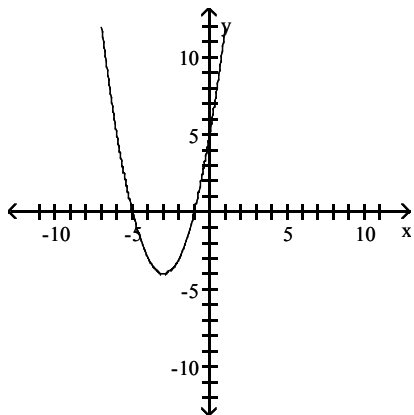
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1) $F(c) = 1.8c + 32$

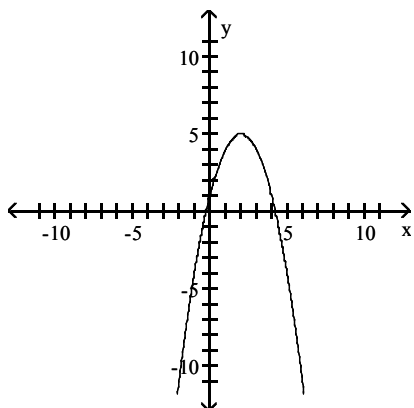


- 2) b) Line of best fit: $y = 12.75x + 41.29$; c) The slope is 12.75, it indicates that Tom is saving approximately \$12.75 per month since his college graduation; d) Tom may be able to save \$347.29 in the 24th month.

3) $f(x) = x^2 + 6x + 5$ Vertex: $(-3, -4)$; Axis of symmetry: $x = -3$;
 y-intercept: $(0, 5)$; Point symmetric: $(-6, 5)$
 x-intercepts: $(-1, 0)$, $(-5, 0)$



4) $f(x) = -x^2 + 4x + 1$ Vertex: $(2, 5)$; Axis of symmetry: $x = 2$
 y-intercept: $(0, 1)$; Point symmetric: $(4, 1)$
 x-intercepts: $\{2 \pm \sqrt{5}\}$ (exact); approximate: $\{-.24, 4.24\}$



Answer Key

Testname: 105P3082

5) minimum; $-\frac{19}{3}$

6) maximum; $-\frac{65}{11}$

7) $f(x) = -x^2 + 2x + 3$. Use $f(x) = a(x-h)^2 + k$ with $(h, k) = (1, 4)$ and y-int: $(0, 3)$ to get value of a.

$$f(x) = a(x-1)^2 + 4 \rightarrow \text{Since y-int. is on graph, we have } 3 = a(0-1)^2 + 4 \rightarrow a = -1 \rightarrow f(x) = -1(x-1)^2 + 4$$

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

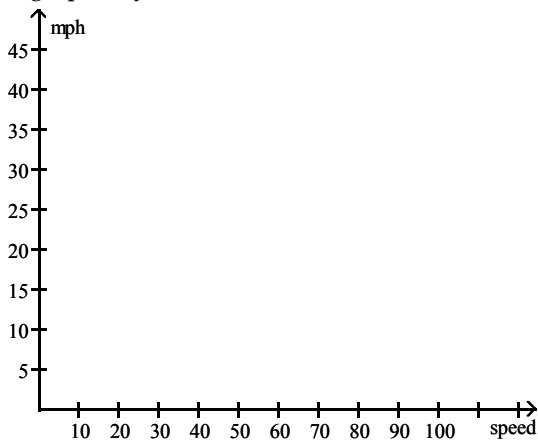
8) a) Price that will maximize the revenue = \$105; b) Maximum Revenue = \$55,125

9) a) Projectile will reach its maximum height after 20 sec; b) Maximum height = 4400 feet

10) Largest area that can be enclosed = 12,482 ft²

11) Graph $y_1 = -16t^2 + 32t + 218$ and $y_2 = 90$. Use your calculator to determine the time interval in which y_1 is greater than y_2 . $\rightarrow \{t | 0 \leq t \leq 4\}$ (set-builder notation); $[0, 4]$ (interval notation)

12) Find the Profit function first $P(x) = -.2x^2 + 8x$, then use your calculator to determine when the graph of $P(x)$ is above the graph of $y = 51.20 \rightarrow \{x | 8 < x < 32\}$ (set-builder notation); $(8, 32)$ (interval notation)



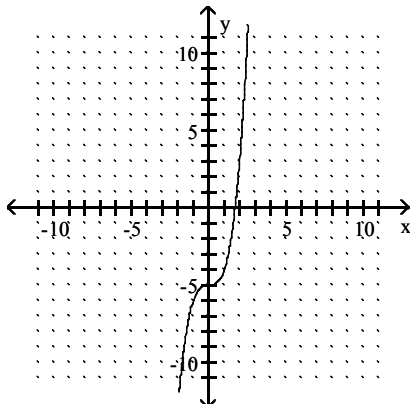
13)

$$M(s) = -0.0063s^2 + 0.720s + 5.143$$

14) key points $(-1, -1) \rightarrow (-1, -6)$

$(0, 0) \rightarrow (0, -5)$

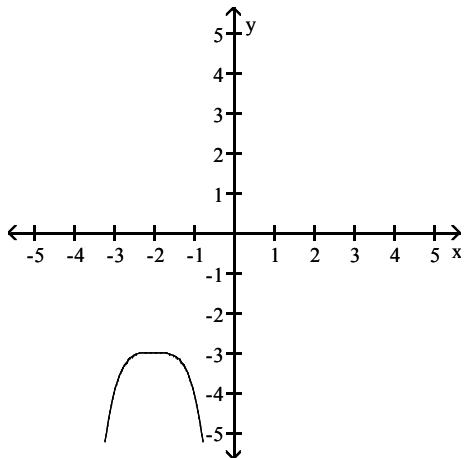
$(1, 1) \rightarrow (1, -4)$



Answer Key

Testname: 105P3082

- 15) key points: $(-1, 1) \rightarrow (-3, 1) \rightarrow (-3, -1) \rightarrow (-3, -4)$
 $(0, 0) \rightarrow (-2, 0) \rightarrow (-2, 0) \rightarrow (-2, -3)$
 $(1, 1) \rightarrow (-1, 1) \rightarrow (-1, -1) \rightarrow (-1, -4)$



- 16) 5, multiplicity 1, crosses x-axis; -3, multiplicity 4, touches x-axis

17) $P(x) = (x + 3)^2(x - 1)(x - 5)^3$

- 18) a) -2, 3 multiplicity 1, 1 multiplicity 2

b) Degree 4; resembles $y = x^4$ for large $|x|$

c) y-intercept: -6

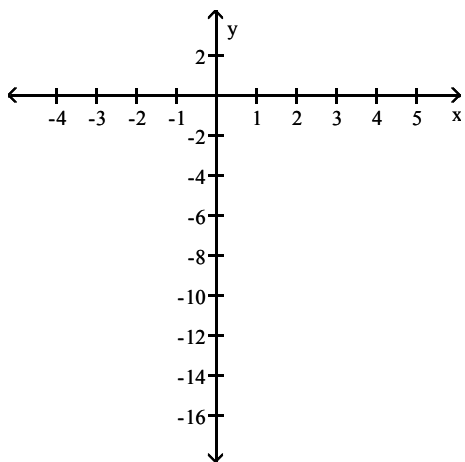
d) Relative maximum: 0 ; relative minima: $(-1.15, -16.31)$ and $(2.40, -5.17)$

e) # of turning points: 3 ; coordinates of turning points: $(-1.15, -16.31)$, $(1, 0)$ and $(2.40, -5.17)$

f) Decreasing on: $(-\infty, -1.15)$ and $(1, 2.40)$

Increasing on: $(-1.15, 1)$ and $(2.40, \infty)$

Graph



19) $P(x) = \left(\frac{1}{30}\right)(x + 2)(x - 3)(x - 5)^2$

- 20) $\{x \mid x \leq -2 \text{ or } x \geq 2\}$ (set-builder notation); $(-\infty, -2]$ or $[2, \infty)$ (interval notation)

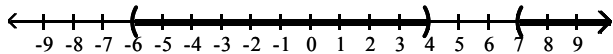
21) $[-4, 4] \cup [6, \infty)$

22) $(-4, 1) \cup (1, \infty)$

Answer Key

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23) $(-6, 4)$ or $(7, \infty)$



24) $[1, 2)$ or $[3, \infty)$

25) D

26) $x = 4, x = -4$

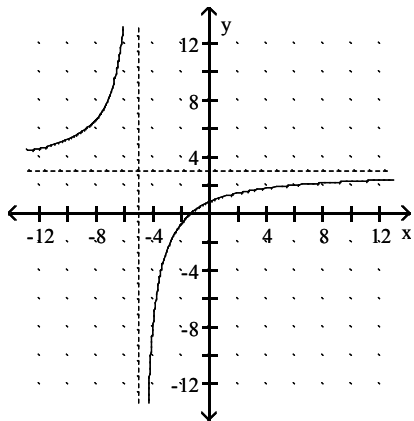
27) $y = 2$

28) $f(x) = \frac{3x+4}{x+5}$

x-intercept: $(-4/3, 0)$; y-intercept: $(0, 4/5)$

Vertical Asymptote: $x = -5$; Horizontal Asymptote: $y = 3$

Additional points: Find 2 points to the left of the V.A, 1 point between the V.A and the x-intercept, and 1 point to the right of the x-intercept in addition to the y-intercept.



29) $f(x) = \frac{1}{x-3} + 2$

V.A: $x = 3$ H.A: $y = 2$

x-intercept: $(2.5, 0)$; y-intercept: $(0, 5/3)$

Find the additional points by moving the key points of $y = 1/x$ 3 units to the right, then 2 units up.

