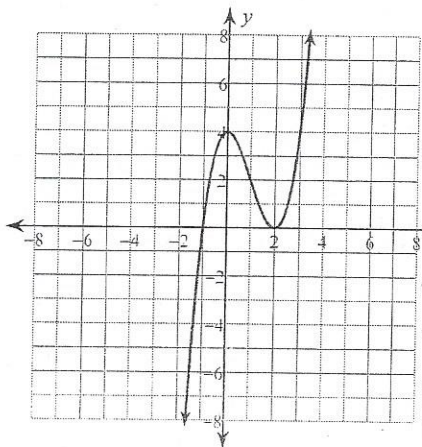


Polynomial Review

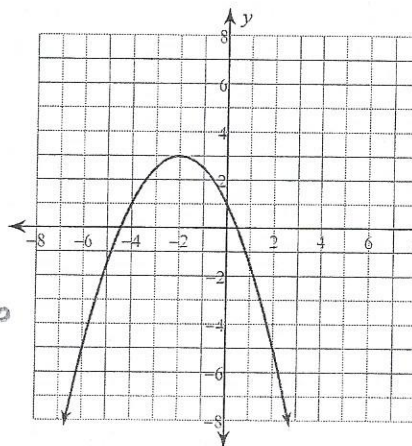
State the relative max/min, roots, end-behavior, whether the function is even or odd, sign of leading coefficient, and least possible degree.

1)



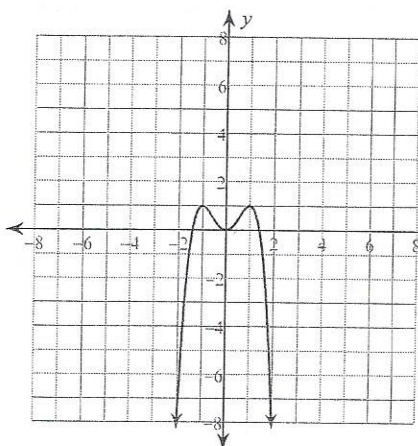
R Max: (0, 4)
 R Min: (2, 0)
 Roots: (-1, 0) (2, 0)
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 ODD
 LC Positive
 Degree: 3

2)



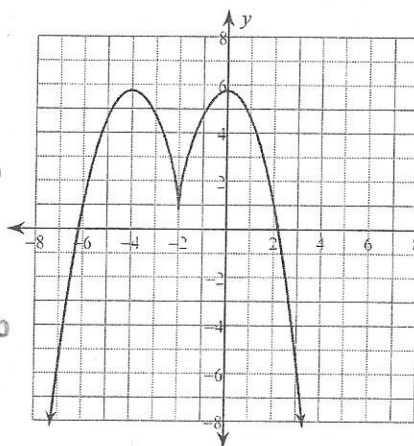
R Max: (-2, 3)
 R Min: None
 Roots: (-4.5, 0) (1.5, 0)
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 Even
 LC Negative
 Degree: 2

3)



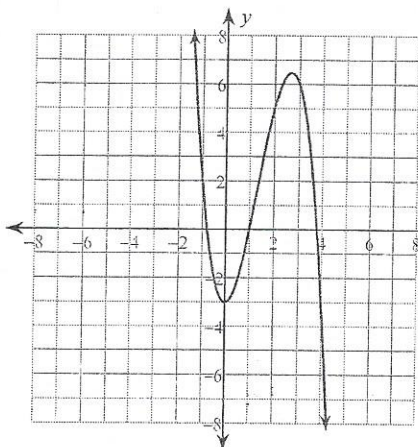
R Max: (-1, 1) (1, 1)
 R Min: (0, 0)
 Roots: (-1.5, 0) (0, 0)
 (1.5, 0)
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 Even
 LC Negative
 Degree: 4

4)



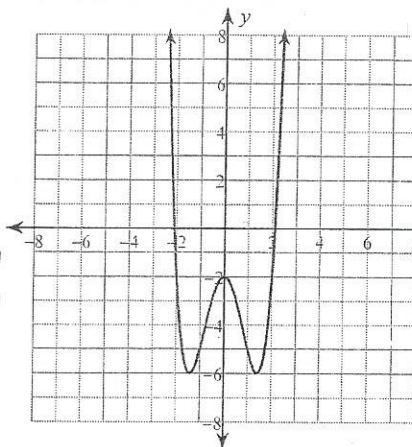
R Max: (-4, 5.75) (0, 5.75)
 R Min: (-2, 1)
 Roots: (-6.25, 0) (2.25, 0)
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 Even
 LC Negative
 Degree: 4

5)



R Max: (2.5, 6.5)
 R Min: (0, -3)
 Roots: (-0.75, 0) (1, 0)
 (3.75, 0)
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 ODD
 LC Negative
 Degree: 3

6)



R Max: (0, -2)
 R Min: (-1.5, -6) (1.5, -6)
 Roots: (-2, 0) (2, 0)
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 Even
 LC Positive
 Degree: 4

Factor each to linear factors and find all zeros. One zero has been given.

7) $f(x) = x^3 - 13x^2 + 47x - 35$; 5

$$\begin{array}{r|rrrr} 5 & 1 & -13 & 47 & -35 \\ & \downarrow & & & \\ & & 5 & -40 & 35 \\ \hline & 1 & -8 & 7 & 0 \end{array}$$

$$(x-5)(x^2 - 8x + 7) = 0$$

$$f(x) = (x-5)(x-1)(x-7) \quad \boxed{5, 1, 7}$$

8) $f(x) = x^3 - 7x + 6$; 2

$$\begin{array}{r|rrrr} 2 & 1 & 0 & -7 & 6 \\ & \downarrow & & & \\ & & 2 & 4 & -6 \\ \hline & 1 & 2 & -3 & 0 \end{array}$$

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

$$f(x) = (x-2)(x+3)(x-1) \quad \boxed{2, -3, 1}$$

9) $f(x) = x^3 + 3x^2 - 18x - 40$; -2

$$\begin{array}{r|rrrr} -2 & 1 & 3 & -18 & -40 \\ & \downarrow & & & \\ & & -2 & -2 & 40 \\ \hline & 1 & 1 & -20 & 0 \end{array}$$

$$(x+2)(x^2 + x - 20)$$

$$f(x) = (x+2)(x+5)(x-4) \quad \boxed{-2, -5, 4}$$

10) $f(x) = x^3 - 11x^2 + 35x - 25$; 5

$$\begin{array}{r|rrrr} 5 & 1 & -11 & 35 & -25 \\ & \downarrow & & & \\ & & 5 & -30 & 25 \\ \hline & 1 & -6 & 5 & 0 \end{array}$$

$$(x-5)(x^2 - 6x + 5)$$

$$(x-5)(x-1)(x-5) = f(x) = (x-1)(x-5)^2 \quad \boxed{1, 5 \text{ mult } 2}$$

11) $f(x) = x^3 - 8x^2 + 20x - 16$; 2

$$\begin{array}{r|rrrr} 2 & 1 & -8 & 20 & -16 \\ & \downarrow & & & \\ & & 2 & -12 & 16 \\ \hline & 1 & -6 & 8 & 0 \end{array}$$

$$(x-2)(x^2 - 6x + 8)$$

$$(x-2)(x-2)(x-4)$$

$$f(x) = (x-4)(x-2)^2 \quad \boxed{4, 2 \text{ mult } 2}$$

12) $f(x) = x^3 + x^2 - 37x + 35$; 5

$$\begin{array}{r|rrrr} 5 & 1 & 1 & -37 & 35 \\ & \downarrow & & & \\ & & 5 & 30 & -35 \\ \hline & 1 & 6 & -7 & 0 \end{array}$$

$$(x-5)(x^2 + 6x - 7)$$

$$f(x) = (x-5)(x+7)(x-1) \quad \boxed{5, -7, 1}$$

Use the following information to complete the problems.

13) $p(x) = x^2 - 3x + 1$

$$\begin{array}{r|rrr} 2 & 1 & -3 & 1 \\ & \downarrow & & \\ & & 2 & -2 \\ \hline & 1 & -1 & -1 \end{array}$$

a. find $p(2)$

$$\boxed{-1}$$

b. find $p(x+1)$

$$(x+1)^2 - 3(x+1) + 1$$

$$(x+1)(x+1) - 3x - 3 + 1$$

$$x^2 + x + x + 1 - 3x - 2$$

$$\boxed{x^2 - x - 1}$$

Polynomial Review

Divide using long division.

1) $(n^4 - 15n^3 + 60n^2 - 108n + 89) \div (n - 10)$

$$\begin{array}{r} n-10 \overline{) n^4 - 15n^3 + 60n^2 - 108n + 89} \\ \underline{-(n^4 - 10n^3)} \\ -5n^3 + 60n^2 \\ \underline{-(-5n^3 + 50n^2)} \\ 10n^2 - 108n \\ \underline{-(10n^2 - 100n)} \\ -8n + 89 \\ \underline{-(-8n + 80)} \\ 9 \end{array}$$

$$n^3 - 5n^2 + 10n - 8 + \frac{9}{n-10}$$

Divide using synthetic division.

3) $(p^3 - 3p^2 - 27p - 3) \div (p + 4)$

$$\begin{array}{r} -4 \overline{) 1 \quad -3 \quad -27 \quad -3} \\ \underline{\downarrow -4 \quad 28 \quad -4} \\ 1 \quad -7 \quad 1 \quad -7 \end{array}$$

$$p^2 - 7p + 1 - \frac{7}{p+4}$$

2) $(-14x^3 - 23x^2 + 22x - 28) \div (2x + 5)$

$$\begin{array}{r} 2x+5 \overline{) -14x^3 - 23x^2 + 22x - 28} \\ \underline{-(-14x^3 - 35x^2)} \\ 12x^2 + 22x \\ \underline{-(12x^2 + 30x)} \\ -8x - 28 \\ \underline{-(-8x - 20)} \\ -8 \end{array}$$

$$-7x^2 + 6x - 4 - \frac{8}{2x+5}$$

4) $(n^4 + 7n^3 + 6) \div (n + 7)$

$$\begin{array}{r} -7 \overline{) 1 \quad 7 \quad 0 \quad 0 \quad 6} \\ \underline{\downarrow -7 \quad 0 \quad 0 \quad 0} \\ 1 \quad 0 \quad 0 \quad 0 \quad 6 \end{array}$$

$$n^3 + \frac{6}{n+7}$$

Evaluate each function at the given value using synthetic substitution.

5) $f(m) = m^4 + m^3 - 19m^2 + 11m + 32$ at $m = -5$

$$\begin{array}{r} -5 \overline{) 1 \quad 1 \quad -19 \quad 11 \quad 32} \\ \underline{\downarrow -5 \quad 20 \quad -5 \quad -30} \\ 1 \quad -4 \quad 1 \quad 6 \quad 2 \end{array}$$

2

6) $f(x) = x^5 + 5x^4 - 3x^3 - 9x^2 + 24x - 16$ at $x = -5$

$$\begin{array}{r} -5 \overline{) 1 \quad 5 \quad -3 \quad -9 \quad 24 \quad -16} \\ \underline{\downarrow -5 \quad 0 \quad 15 \quad -30 \quad 30} \\ 1 \quad 0 \quad -3 \quad 6 \quad -6 \quad 14 \end{array}$$

14

7) $f(a) = 2a^6 - 12a^5 + 16a^4 - 31a^3 + 7a^2 - 5a - 28$ at $a = 5$

$$\begin{array}{r} 5 \overline{) 2 \quad -12 \quad 16 \quad -31 \quad 7 \quad -5 \quad -28} \\ \underline{\downarrow 10 \quad -10 \quad 30 \quad -5 \quad 10 \quad 25} \\ 2 \quad -2 \quad 6 \quad -7 \quad 2 \quad 5 \quad -3 \end{array}$$

-3

8) $f(n) = n^6 + 2n^4 - 5n^3 - 9n^2 - 15n - 2$ at $n = 2$

$$\begin{array}{r} 2 \overline{) 1 \quad 0 \quad 2 \quad -5 \quad -9 \quad -15 \quad -2} \\ \underline{\downarrow 2 \quad 4 \quad 12 \quad 14 \quad 10 \quad -10} \\ 1 \quad 2 \quad 6 \quad 7 \quad 5 \quad -5 \quad -12 \end{array}$$

-12

