

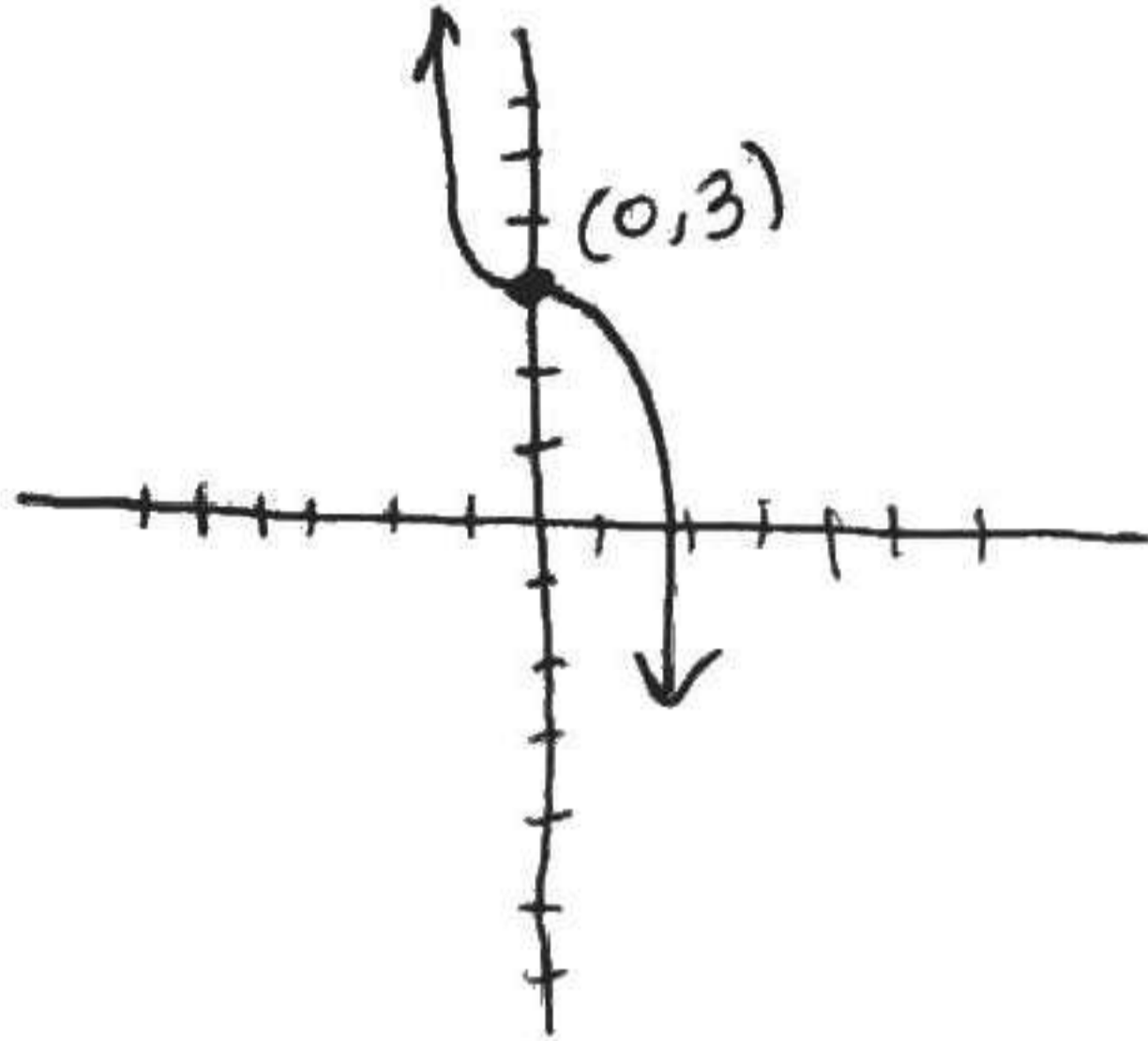
Functional Analysis

Chapter 4 Review (4.1-4.2)

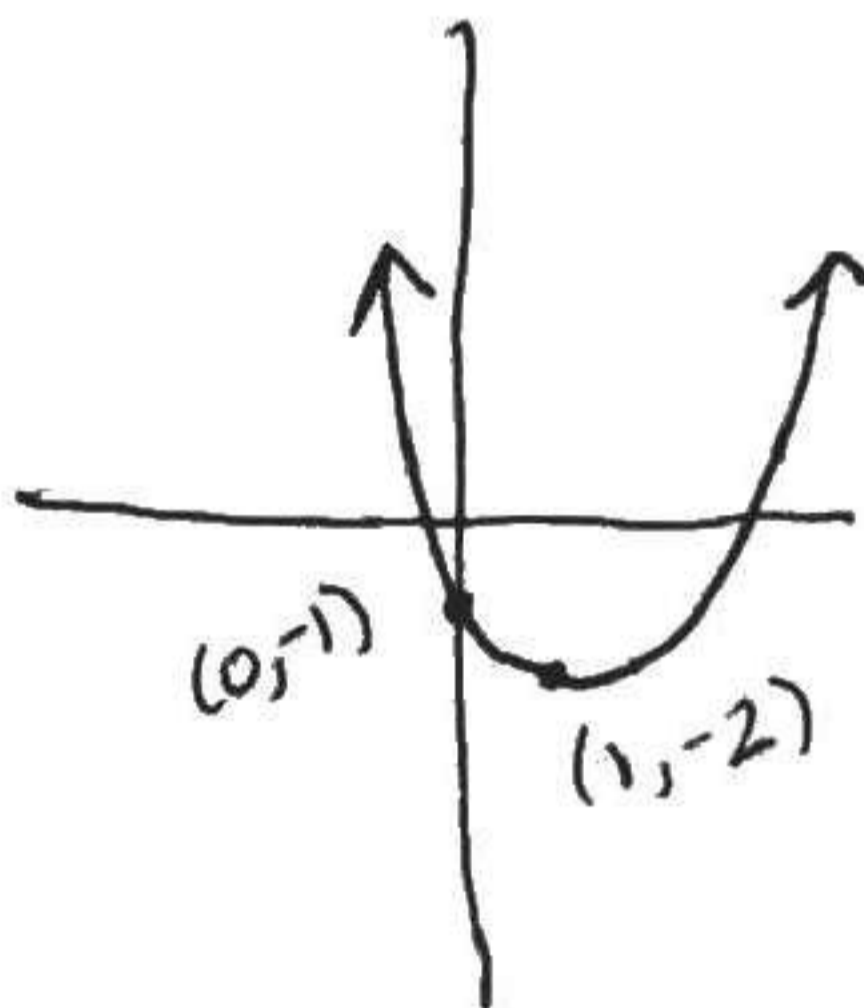
Name Key

In Problems 1 - 3, graph each function using transformations (shifting, compressing, stretching, and reflections). Show all the stages.

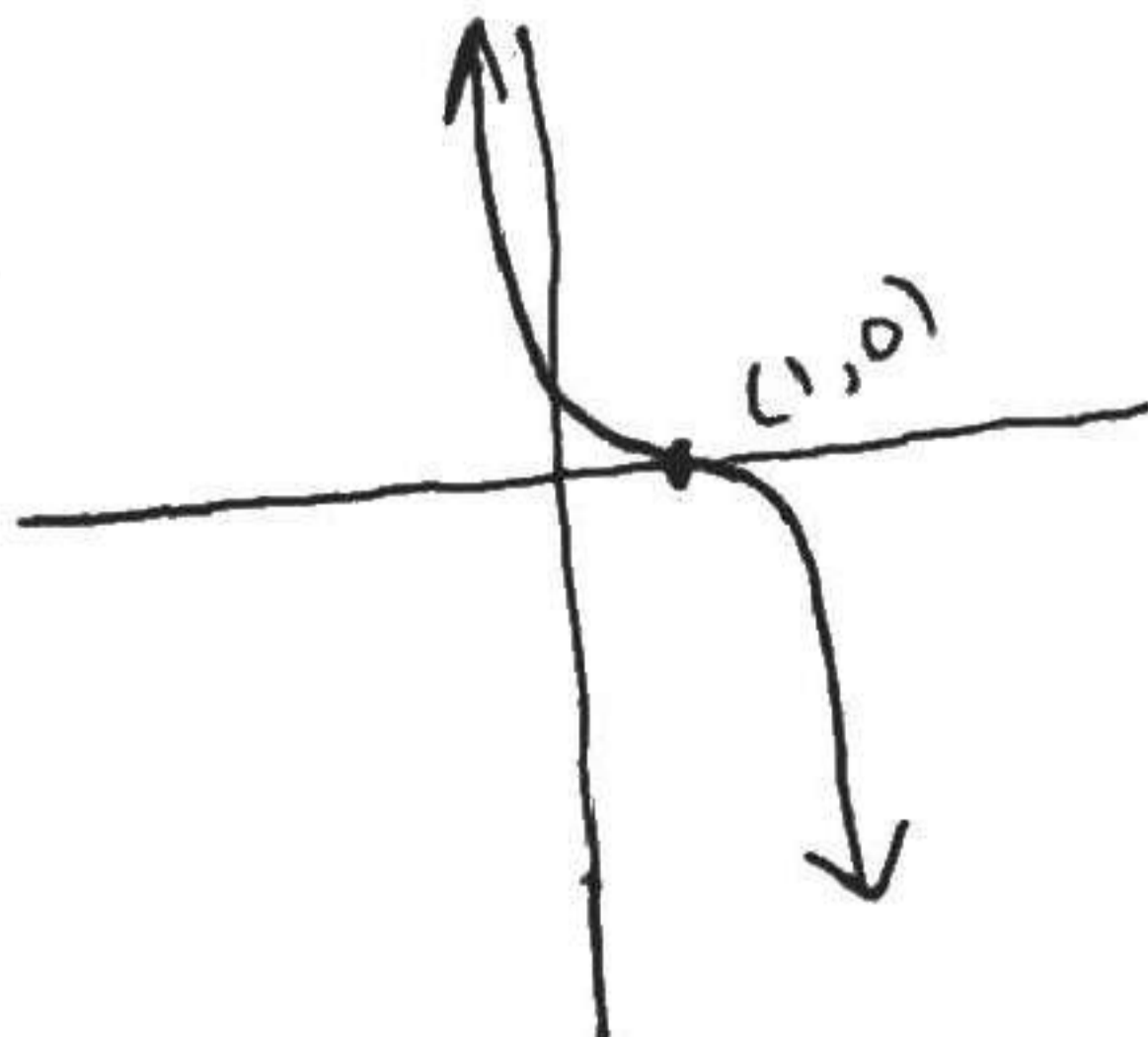
1.  $f(x) = -x^3 + 3$



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

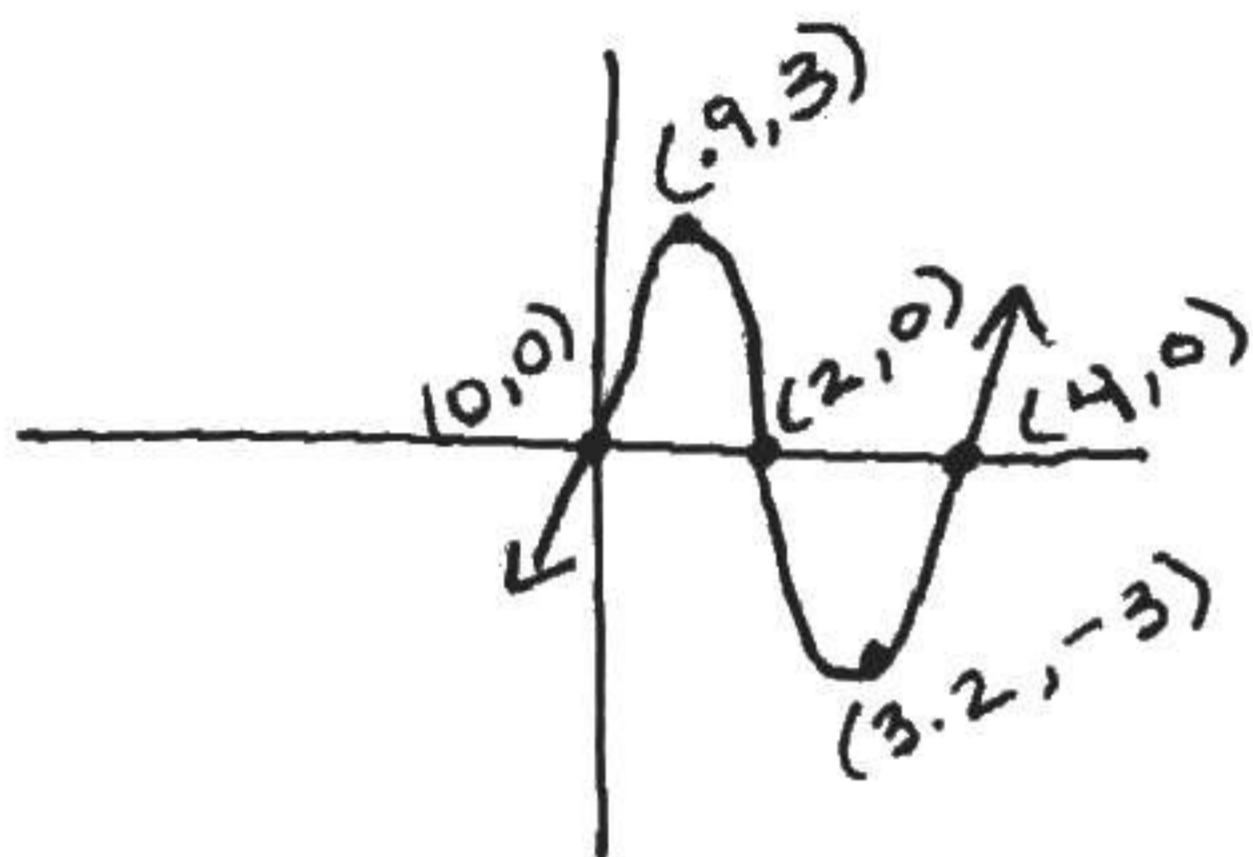


3.  $f(x) = (1 - x)^3$

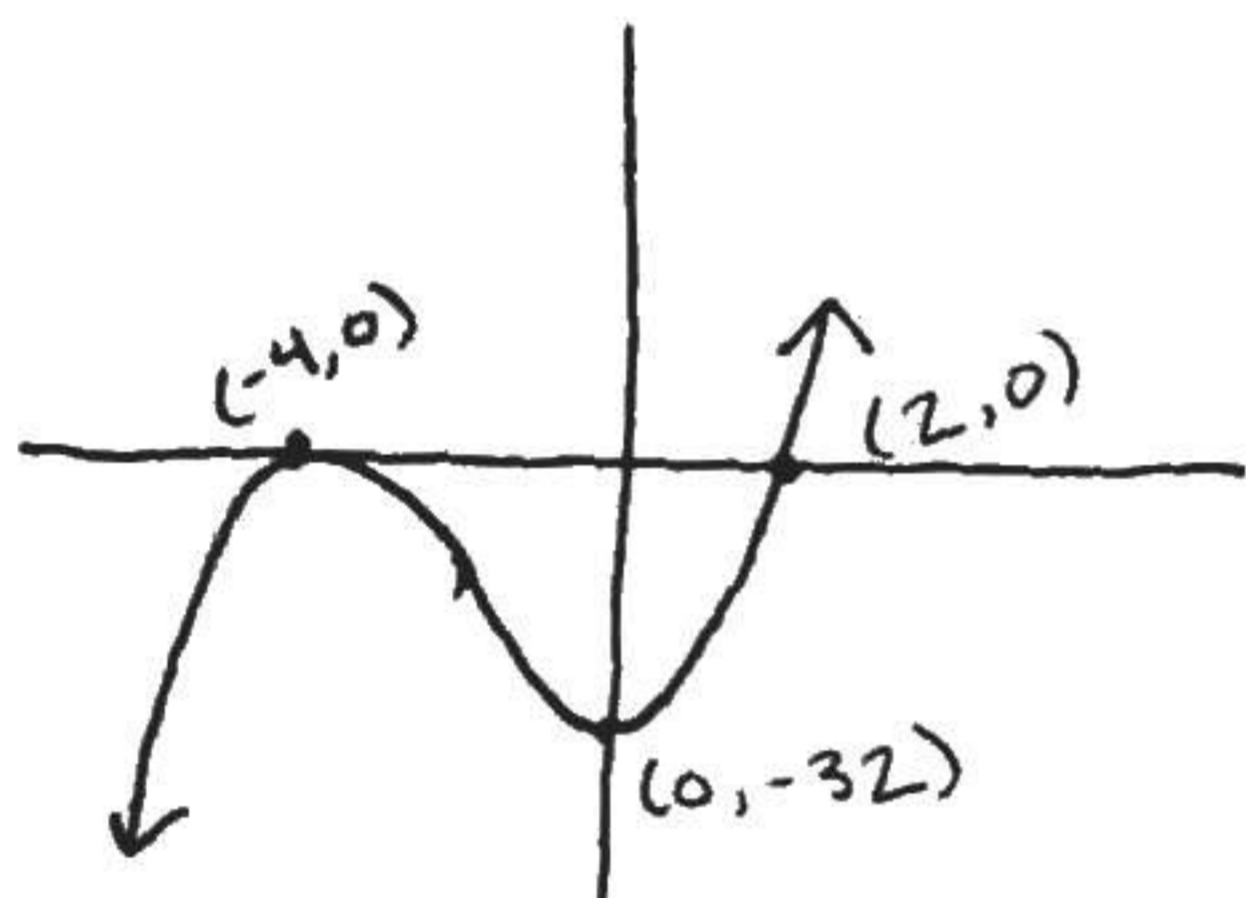


In Problems 4 – 7, analyze each polynomial by following Steps 1 through 8 on page 190.

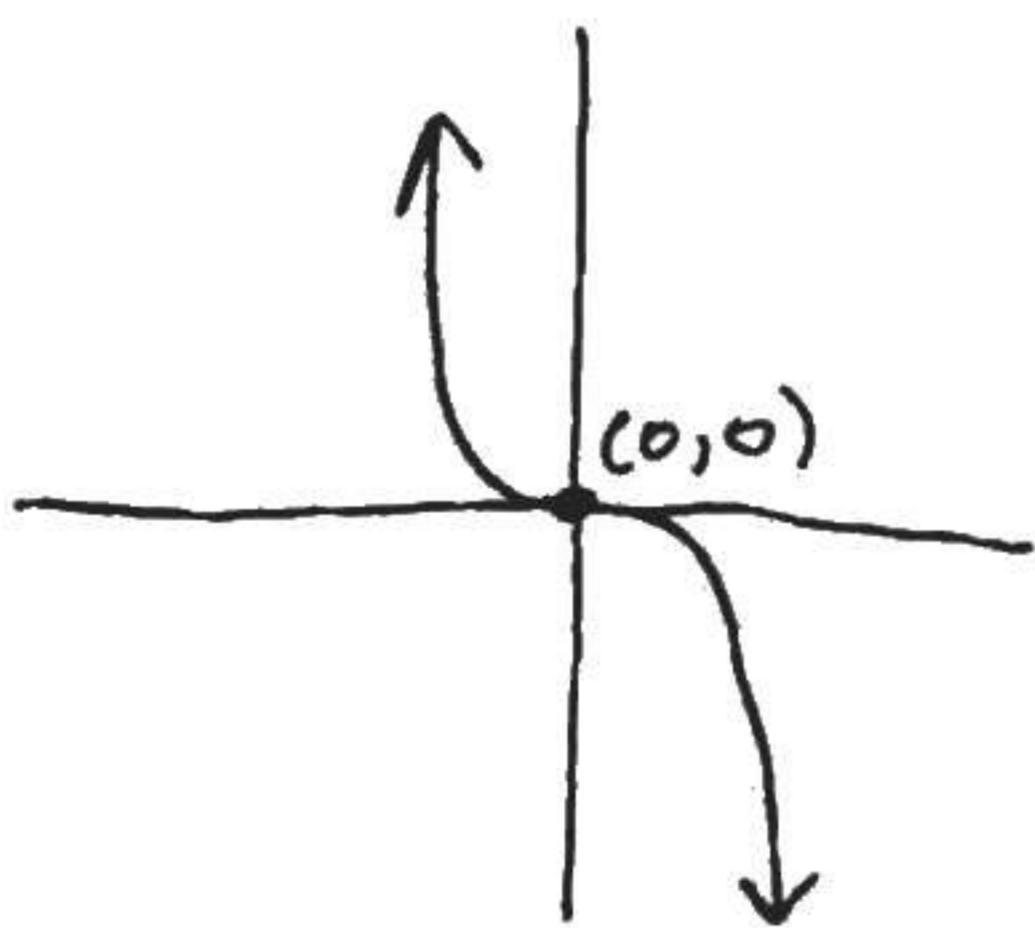
4.  $f(x) = x(x-2)(x-4)$



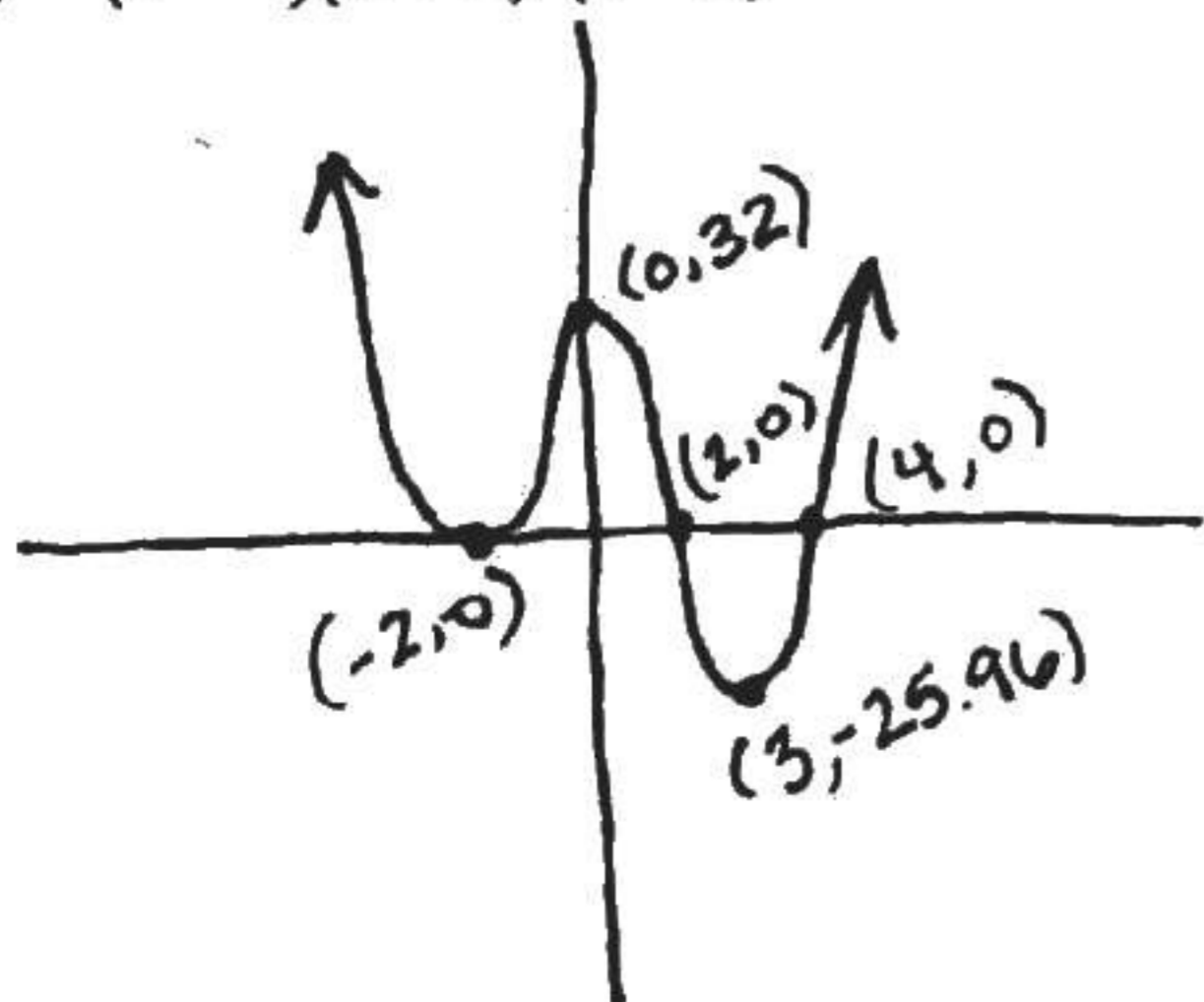
5.  $f(x) = (x-2)(x+4)^2$



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



7.  $f(x) = (x-4)(x+2)^2(x-2)$



In Problems 8 and 6, find the remainder  $R$  when  $f(x)$  is divided by  $g(x)$ . Is  $g$  a factor of  $f$ ?

8.  $f(x) = 2x^3 + 8x^2 - 5x + 5$ ;  $g(x) = x - 2$

$$\begin{array}{r} 2 \overline{) 2 \ 8 \ -5 \ 5} \\ \underline{\downarrow 4 \ 24 \ 38} \\ 2 \ 12 \ 19 \ 43 \end{array}$$

$R = 43$

9.  $f(x) = x^4 - x^2 + 2x + 2$ ;  $g(x) = x + 1$

$$\begin{array}{r} -1 \overline{) 1 \ 0 \ -1 \ 2 \ 2} \\ \underline{-1 \ 1 \ 0 \ -2} \\ 1 \ -1 \ 0 \ 2 \ 0 \end{array}$$

$R = 0$

$(x+1)$  is a factor

10. Find the value of  $f(x) = -16x^3 + 18x^2 - x + 2$  at  $x = -2$ .

$$f(-2) = -16(-2)^3 + 18(-2)^2 - (-2) + 2 = 204$$

11. List all the potential rational zeros of  $f(x) = -6x^5 + x^4 + 2x^3 - x + 1$ .

$Q = \pm 1, \pm 2, \pm 3, \pm 6$

In Problems 12 – 14, use the Rational Zeros Theorem to find all the real zeros of each polynomial function. Use the zeros to factor  $f$  over the real numbers.

12.  $f(x) = x^3 - x^2 - 10x - 8$

$P = \pm 1, \pm 2, \pm 4, \pm 8$

$Q = \pm 1$

$$\begin{array}{r} -1 \overline{) 1 \ -1 \ -10 \ -8} \\ \underline{-1 \ 2 \ 8} \end{array}$$

$$\underline{\hspace{1.5cm}} \\ 1 \ -2 \ -8 \ 0$$

$(x+1)(x^2 - 2x - 8)$

$(x+1)(x-4)(x+2)$

$\{-1, 4, -2\}$

$$13. f(x) = 4x^3 - 4x^2 - 7x - 2$$

$$\frac{P}{Q} = \left\{ \pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm 2, \pm 3 \right\}$$

$$\frac{4}{2} = 2$$

$$P = \pm 1, \pm 2$$

$$Q = \pm 1, \pm 2, \pm 4$$

$$\begin{array}{r} 2 \overline{) 4 \ -4 \ -7 \ -2} \\ \underline{\phantom{2} 8 \ 8 \ 2} \\ 4 \ 4 \ 1 \ 0 \end{array}$$

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

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

$$\left\{ 2, -\frac{1}{2} \right\}$$

$-\frac{1}{2}$  Double root

$$14. f(x) = x^4 + 6x^3 + 11x^2 + 12x + 18$$

$$P = \pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$$

$$Q = \pm 1$$

$$\begin{array}{r} -3 \overline{) 1 \ 6 \ 11 \ 12 \ 18} \\ \underline{\phantom{-3} -3 \ -9 \ -6 \ -18} \\ 1 \ 3 \ 2 \ 6 \ 0 \end{array}$$

$$(x+3)(x^3 + 3x^2 + 2x + 6)$$

$$-3$$