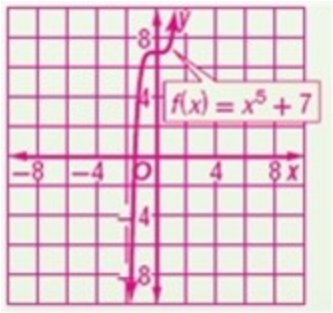
2-2 Polynomial Functions

Graph each function.

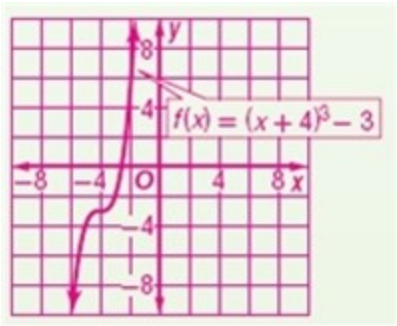
4. $f(x) = x^5 + 7$

ANSWER:



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

ANSWER:



Describe the end behavior of the graph of each polynomial function using limits. Explain your reasoning using the leading term test.

12. $f(x) = -5x^7 + 6x^4 + 8$

ANSWER:

The degree is 7, and the leading coefficient is −5. Because the degree is odd and the leading coefficient is negative, $\lim_{x \to -\infty} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = -\infty$.

16. $h(x) = 8x^2 + 5 - 4x^3$

ANSWER:

The degree is 3, and the leading coefficient is −4. Because the degree is odd and the leading coefficient is negative, $\lim_{x \to -\infty} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = -\infty$.

20. $f(x) = -x(x - 4)(x + 5)$

ANSWER:

The degree is 3, and the leading coefficient is −1. Because the degree is odd and the leading coefficient is negative, $\lim_{x \to -\infty} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = -\infty$.

2-2 Polynomial Functions

State the number of possible real zeros and turning points of each function. Then determine all of the real zeros by factoring.

24. $f(x) = x^6 - 8x^5 + 12x^4$

ANSWER:

6 real zeros and 5 turning points; 0, 6, and 2

28. $f(x) = 4x^8 + 16x^4 + 12$

ANSWER:

8 real zeros and 7 turning points; no real zeros

32. $f(x) = 3x^5 + 11x^4 - 20x^3$

ANSWER:

5 real zeros and 4 turning points; 0, $\frac{4}{3}$, and –5

For each function, (a) apply the leading-term test, (b) determine the zeros and state the multiplicity of any repeated zeros, (c) find a few additional points, and then (d) graph the function.

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

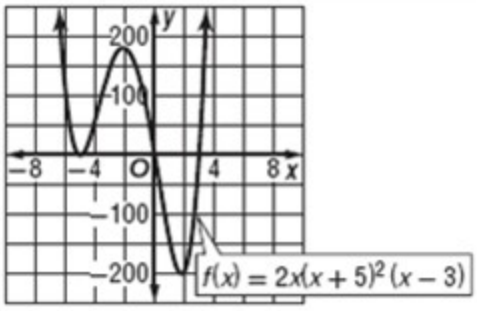
ANSWER:

a. The degree is 4, and the leading coefficient is 2. Because the degree is even and the leading coefficient is positive, $\lim_{x \to -\infty} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = \infty$.

b. 0, −5 (multiplicity:2), 3

c. Sample answer: (−6, 108), (−1, 128), (1, −144), (4, 648)

d.



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

ANSWER:

a. The degree is 3, and the leading coefficient is −2. Because the degree is odd and the leading coefficient is negative, $\lim_{x \to -\infty} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = -\infty$.

b.0, −3, 1

c. Sample answer: (−4, 40), (−2, −12), (0.5, 1.75), (2, −20)

d.