Properties of Exponents

Simplify.

1. $(3a^{-1}b^2)^2$

2. $\left(\frac{x^0y}{2}\right)^{-1}$

3. $\frac{x^{-3}y^4}{x^{-4}y^{-5}}$

4. $(2xy)^{-1}(2x + 2y + xy)$

5. $(3ab^2)(2ab)^2(5a)$

6. $2^{-2} + 3^{-2}$

Classifying Polynomials

For each polynomial state its degree classification (constant, linear, etc.), the leading coefficient, and the constant, and classify it as a monomial, binomial, or trinomial.

7. $3 - x$

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:__________________

8. $2x^4$

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:____________________

9. -1

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:__________________

10. $-z + 5z^2 + 1$

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:____________________

11. $x^3 + 16x$

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:__________________

12. $-3 + \frac{x^4}{2}$

Degree Classification:________________
Leading coefficient:______
Constant:______
Classification:____________________

Factoring

Factor Completely.

13. $x^2 + x - 6$

14. $9b^2 - 4$

15. $2x^2y + 4xy + 2y$

16. $z^3 + 8$

17. $n^9 - 1$

18. $16 - 2x^3$

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

20. $54 + 2a^3$

Rational Root Theorem

Use the rational root theorem to list all possible rational roots for the following two polynomials. You do <u>not</u> have to test to see which numbers are actually roots.

21. $4x^3 - x^2 + 6x + 3$

22. $12x^5 - 4x + 1$

23. $10x^{12} + 7$

24. $2x^2 + x + 2$

25. According to the rational root theorem, the only possible rational roots for the polynomial $-x^4 - 2x^2 + 3$ are 1, –1, 3, and –3. Which of these are actually roots for the polynomial, and which are not?

26. Find all of the rational roots to the polynomial $4x^2 - 1$ by using the rational root theorem to find all possibilities then testing them.

Dividing Polynomials

27. $\frac{x^2+4x+3}{x+1}$

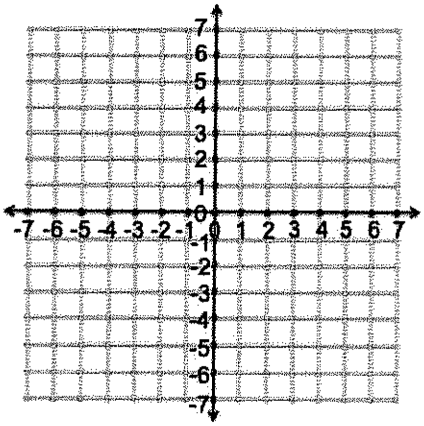
28. $\frac{2x^2+7x+5}{2x+5}$

29. $(x^3 + 5x^2 + 5x - 2) \div (x + 2)$

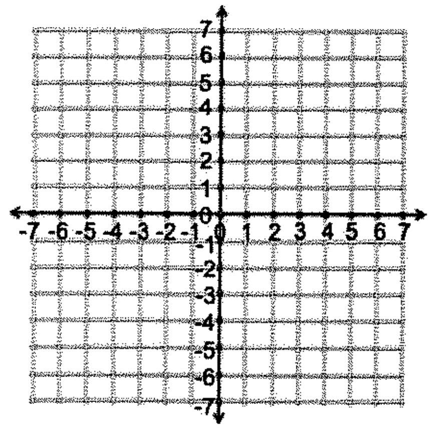
30. $\frac{x^3-27}{x^2+3x+9}$

Graphing Polynomials

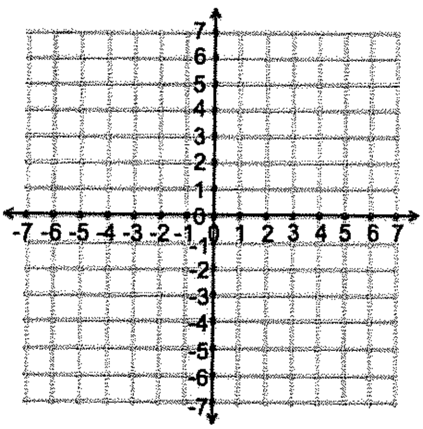
31. $f(x) = -(x-1)^2(2x+5)$



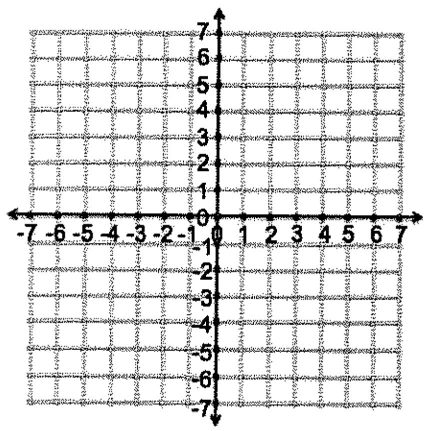
32. $f(x) = x^2 - 2x$



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

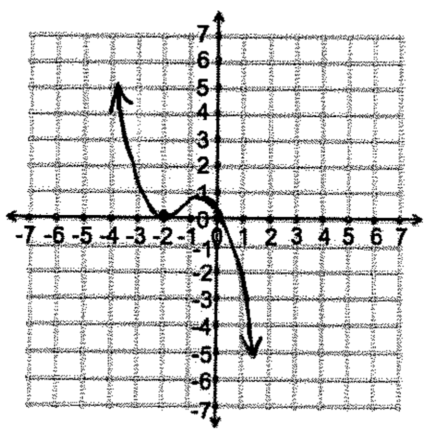


34. $f(x) = -2x^3 - 4x^2 - 2x$

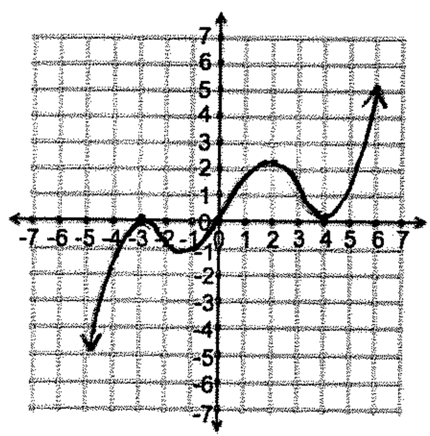


What polynomials are graphed below?

35.



36.



Solving Equations with Rational Expressions

37. $\frac{1}{2} + \frac{1}{x} = \frac{5}{6}$

38. $\frac{1}{x} + \frac{1}{x-1} = \frac{3}{2}$

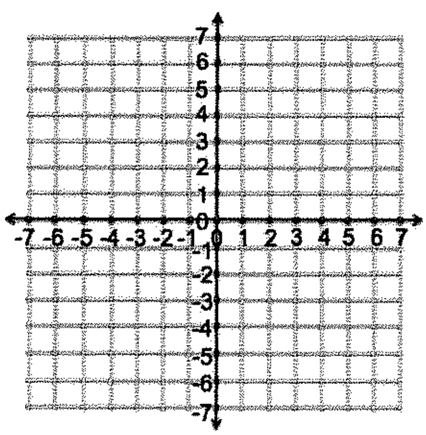
39. $\frac{4}{3x^2} - \frac{1}{3} = \frac{1}{x}$

40. $\frac{2}{x-2} + \frac{1}{x^2-4} = \frac{1}{x+2}$

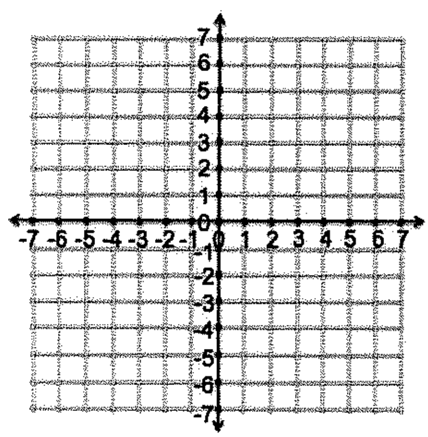
Finding vertical asymptotes

Graph each function. Label the vertical asymptotes.

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



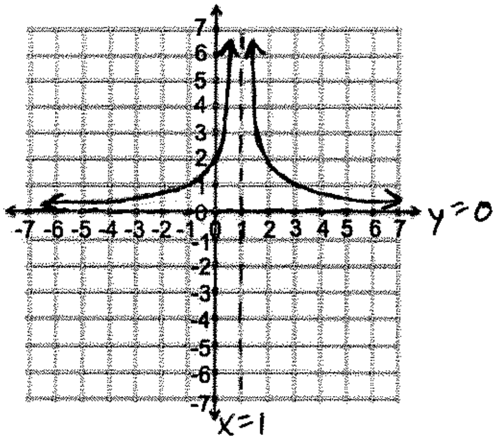
42. $f(x) = \frac{-1}{(x+1)^2}$



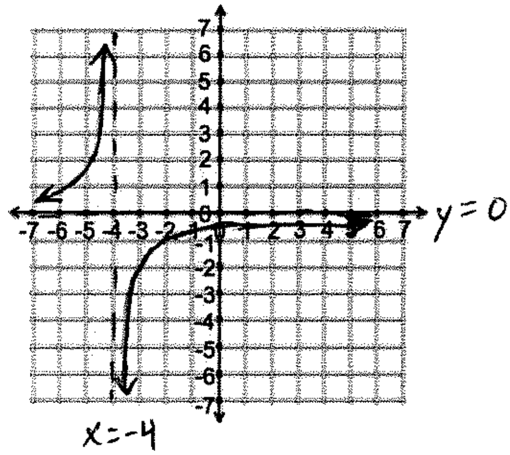
43. Give two different functions: one with a vertical asymptote at $x = 1$, and the other with a hole at $x = 1$.

What rational functions are graphed below?

44.



45.



Finding horizontal asymptotes

46. Let $f(x) = \frac{P(x)}{Q(x)}$ be a rational function. How can the horizontal asymptote (if there is one) be found in the following three cases?

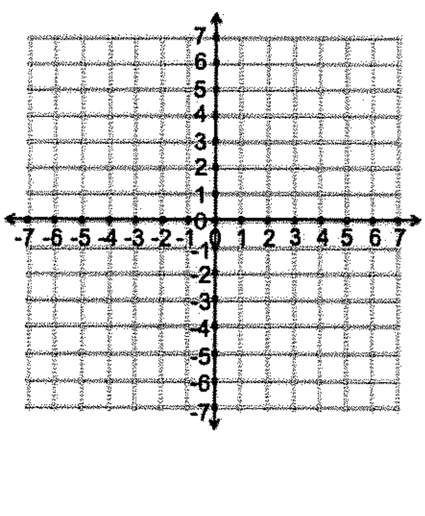
a) degree(P) > degree(Q)

b) degree(P) < degree(Q)

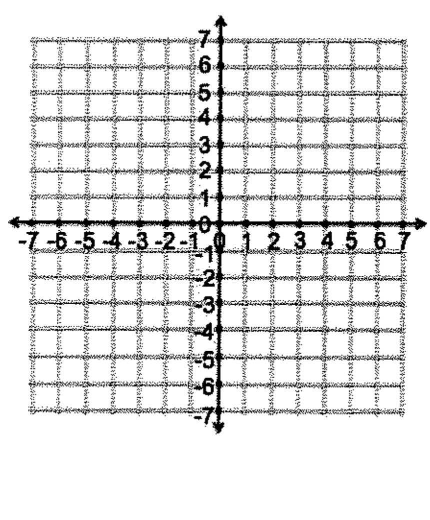
c) degree(P) = degree(Q)

Graph each rational function. Label vertical and horizontal asymptotes.

47. $f(x) = \frac{2x^2-2x}{x^2-1}$



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



49. True or false: All polynomials are rational functions. If true, explain why. If false, give an example that shows why it is false.

50. True or false: All rational functions are polynomials. If true, explain why. If false, give an example that shows why it is false.

Completing the square

51. Let $P(x)$ be a quadratic trinomial with a leading coefficient of 1. What must be true about the linear coefficient and the constant in order for $P(x)$ to factor into a perfect square?

Solve by completing the square.

52. $x^2 - 2x - 8 = 0$

53. $x^2 + 4x + 2 = 0$

54. $3x^2 + 6x - 1 = 0$

55. $-x^2 + 4x + 6 = 0$

Quadratic Formula

Solve with the quadratic formula.

56. $x^2 - 2x - 8 = 0$

57. $x^2 + 4x + 2 = 0$

58. $x^2 = 2x + 1$

59. $x^2 + 3x + 7 = 1 - x + 2x^2$

Vertex form of a parabola

Put each parabola in vertex form and state the vertex.

60. $f(x) = x^2 + 2x + 5$

61. $f(x) = 2x^2 - 5x - 2$

Find the vertex of each parabola by using vertex = $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$.

62. $f(x) = x^2 + 2x - 1$

63. $f(x) = 3x^2 - 3x + 7$