

Name: _____ Date: _____ Band: _____
Algebra 2

Unit 5 Polynomial Functions Study Guide

4.1 Adding, Subtracting, and Multiplying Polynomials

1. Multiply $(x - 2)(x - 1)(x + 3)$

2. Expand $(4x + 2)^4$

Find the sum or difference.

3. $(4x^2 - 12x^2 - 5) - (-8x^2 + 4x + 3)$

4. $(x^4 + 3x^3 - x^2 + 6) + (2x^4 - 3x + 9)$

5. $(3x^2 + 9x + 13) - (x^2 - 2x + 12)$

Find the product.

6. $(2y^2 + 4y - 7)(y + 3)$

7. $(2m + n)^3$

8. $(s + 2)(s + 4)(s - 3)$

Expand the binomial.

9. $(m + 4)^4$

10. $(3s + 2)^5$

11. $(z + 1)^6$

4.2 Dividing Polynomials

12. Use synthetic division to evaluate $f(x) = -2x^3 + 42x^2 + 8x + 10$ when $x = -3$.

Divide using polynomial long division or synthetic division.

13. $(x^3 + x^2 + 3x - 4) \div (x^2 + 2x + 1)$

14. $(x^4 + 3x^3 - 4x^2 + 5x + 3) \div (x^2 + x + 4)$

15. $(x^4 - x^2 - 7) \div (x + 4)$

16. Use synthetic division to evaluate $g(x) = 4x^3 + 2x^2 - 4$ when $x = 5$.

4.3 Factoring Polynomials

17. Factor $x^4 + 8x$ completely.

18. Determine whether $x + 4$ is a factor of $f(x) = x^5 + 4x^4 + 2x + 8$.

Factor the polynomial completely.

19. $64x^3 - 8$

20. $2z^5 - 12z^3 + 10z$

21. $2a^3 - 7a^2 - 8a + 28$

22. Show that $x + 2$ is a factor of $f(x) = x^4 + 2x^3 - 27x - 54$. Then factor $f(x)$ completely.

4.4 Solving Polynomial Equations

23. Find all real solutions of $x^3 + x^2 - 8x - 12 = 0$.

24. Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the zeros -4 and $1 + \sqrt{2}$.

Find all real solutions of the equation.

25. $x^3 + 3x^2 - 10x - 24 = 0$

26. $x^3 + 5x^2 - 2x - 24 = 0$

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

27. $1, 2 - \sqrt{3}$

28. $2, 3, \sqrt{5}$

29. $-2, 5, 3 + \sqrt{6}$

30. You use 240 cubic inches of clay to make a sculpture shaped as a rectangular prism. The width is 4 inches less than the length and the height is 2 inches more than three times the length. What are the dimensions of the sculpture? Justify your answer.

4.5 The Fundamental Theorem of Algebra

31. Find all zeros of $f(x) = x^4 + 2x^3 + 6x^2 + 18x - 27$.

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

32. $3, 1 + 2i$

33. $-1, 2, 4i$

34. $-5, -4, 1 - i\sqrt{3}$

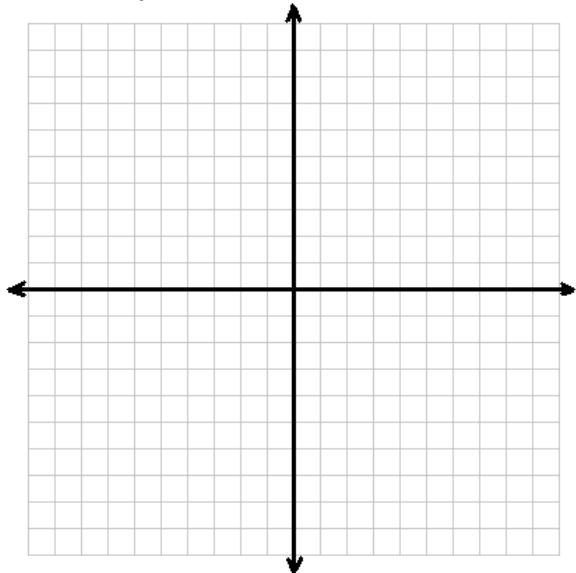
Determine the possible numbers of positive real zeros, negative real zeros, and imaginary zeros for the function.

35. $f(x) = x^4 - 10x + 8$

36. $f(x) = -6x^4 - x^3 + 3x^2 + 2x + 18$

4.6 Graphing Polynomial Functions

37. Graph $f(x) = x^3 + 3x^2 - 3x - 10$



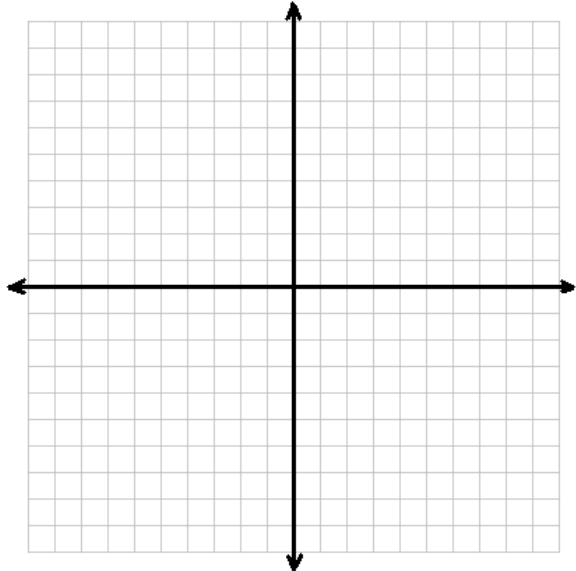
Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

38. $h(x) = -x^3 + 2x^2 - 15x^7$

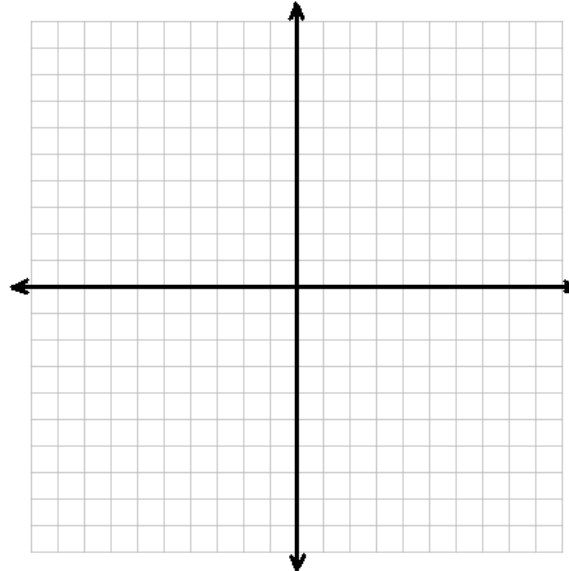
39. $p(x) = x^3 - 5x^{0.5} + 13x^2 + 8$

Graph the polynomial function.

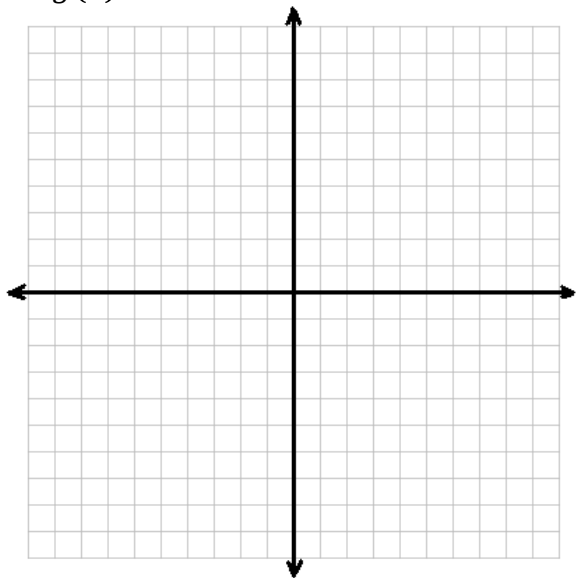
40. $h(x) = x^2 + 6x^5 - 5$



41. $f(x) = 3x^4 - 5x^2 + 1$

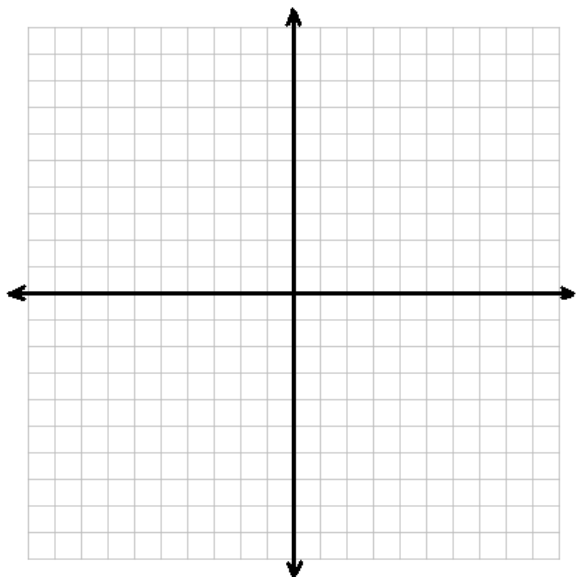


42. $g(x) = -x^4 + x + 2$



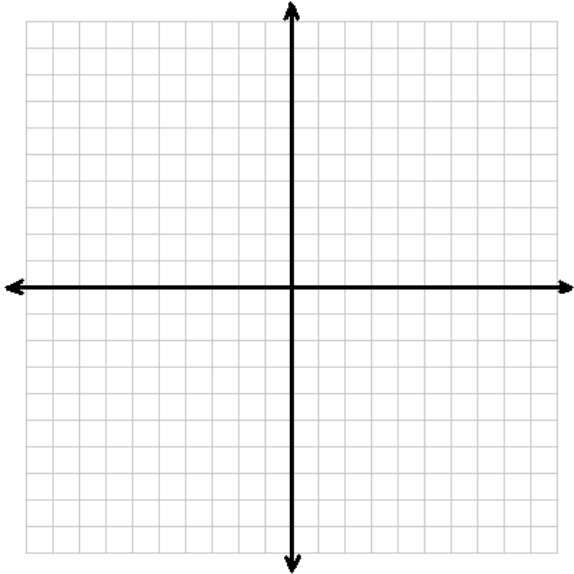
4.7 Transformations of Polynomial Functions

43. Describe the transformation of $f(x) = x^3$ represented by $g(x) = (x - 6)^3 - 2$. Then graph each function.

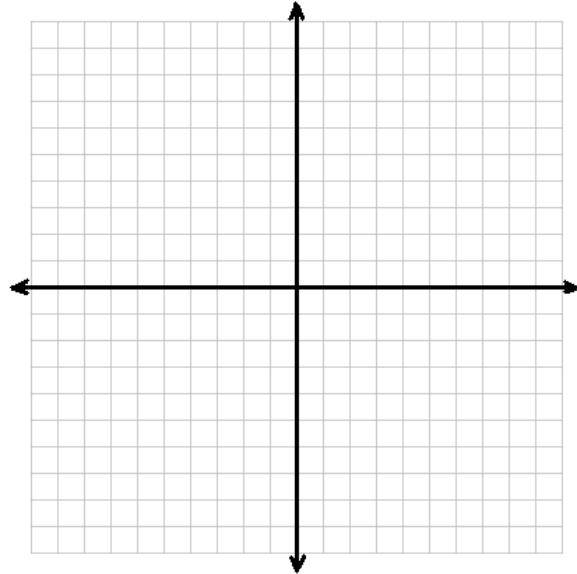


Describe the transformation of f represented by g . Then graph each function.

44. $f(x) = x^3, g(x) = (-x)^3 + 2$



45. $f(x) = x^4, g(x) = -(x + 9)^4$



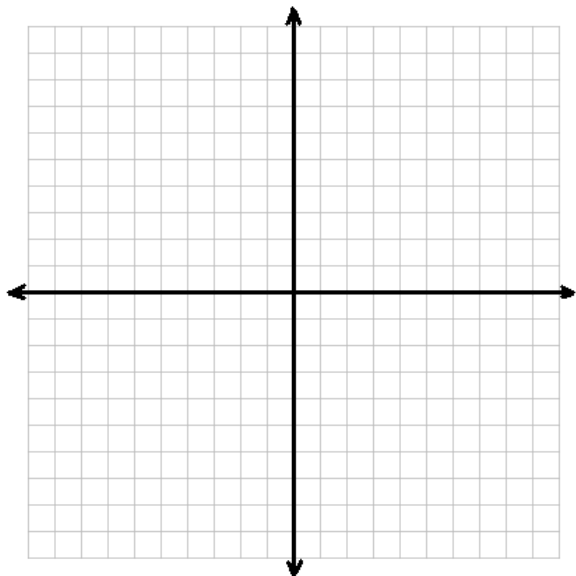
Write a rule for g .

46. Let the graph of g be a horizontal shrink by a factor of 4, followed by a translation 3 units right and 5 units down of the graph of $f(x) = x^5 + 3x$.

47. Let the graph of g be a translation 5 units up, followed by a reflection in the y -axis of the graph of $f(x) = x^4 - 2x^3 - 12$.

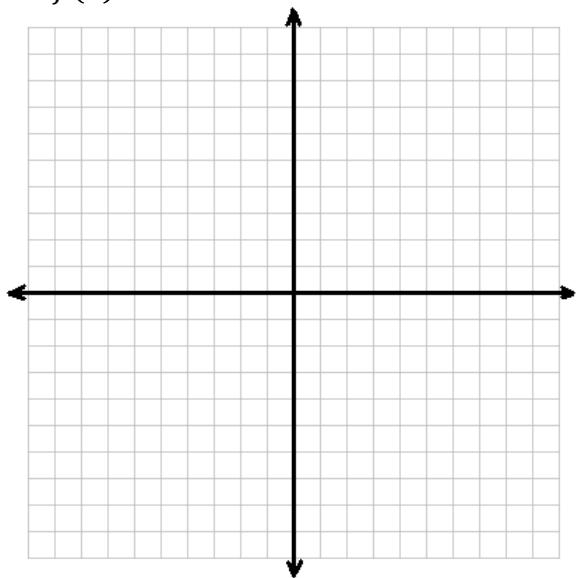
4.8 Analyzing Graphs of Polynomials Functions

48. Graph the function $f(x) = x(x + 2)(x - 2)$. Then estimate the points where the local maximums and local minimums occur.

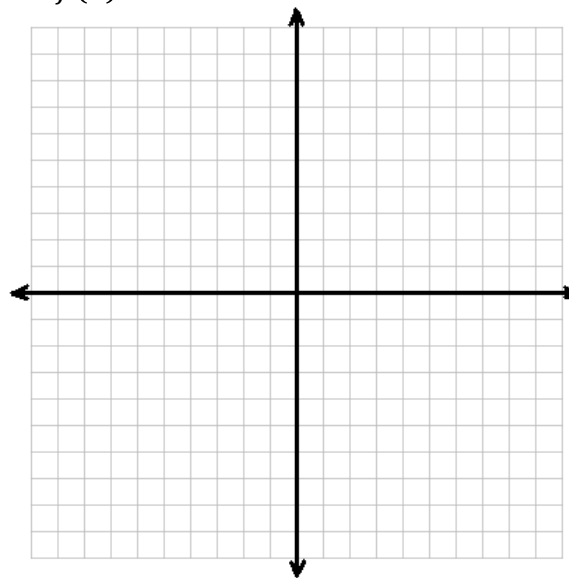


Graph the function. Identify the x -intercepts and the points where the local maximums and local minimums occur. Determine the intervals for which the function is increasing or decreasing.

49. $f(x) = -2x^3 - 3x^2 - 1$



50. $f(x) = x^4 + 3x^3 - x^2 - 8x + 2$



Determine whether the function is *even*, *odd*, or *neither*.

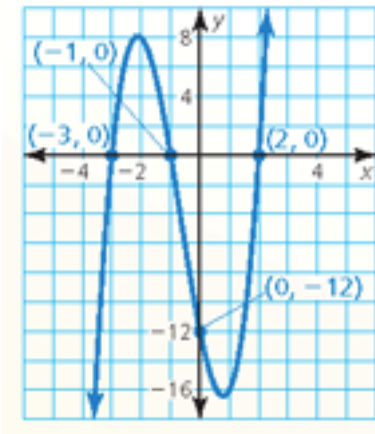
51. $f(x) = 2x^3 + 3x$

52. $g(x) = 3x^2 - 7$

53. $h(x) = x^6 + 3x^5$

4.9 Modeling with Polynomial Functions

54. Write the cubic function whose graph is shown.



55. Write a cubic function whose graph passes through the points $(-4, 0)$, $(4, 0)$, $(0, 6)$, and $(2, 0)$.