

Polynomial Operations

1. Write the polynomial $-23x^7 + x^9 - 6x^3 + 10 + 2x^2$ in standard form, and then identify the degree and leading coefficient.

Perform the indicated operation.

2. $(17x^8 + 11x^2 - 6) + (18x + 7x^8 - 12x^2 + 3)$

3. $(-2x + 13x^5 + 11) - (5 - 9x^3 + x)$

4. $(9x^2 - x + 4) - (5x + 7) + (6x - 11)$

5. $(15x - 11x^{12} + x^9 - x^7 + 3x^2) + (x^7 - 6x^2 - x^9)$

6. $(2x + 3y)(3x^2 - xy + 2y^2)$

7. $(x^3 + 25x^2 + 100x) \div (x + 20)$

8. $(7x^3 - 4x^2 - 400x - 100) \div (x - 8)$

9. $(3x^3 - 11x^2 - 56x - 50) \div (x + 4)$

10. $(x^3 + 8x^2 + 13x + 2) \div (x + 2)$

11. $(5x^3 + 4x^2 - 4x + 1) \div (x + 1)$

Binomial Theorem

Expand the following binomials.

12. $(x-5)^4$

13. $(x+y)^6$

14. $(2x-1)^3$

15. $(3x+y)^5$

16. Find the 15th term of the following binomial: $(x-1)^{16}$

17. Find the 5th term of the following binomial: $(x-2)^7$

18. Find the 3rd term of the following binomial: $(x+2)^5$

19. Find the 2nd term of the following binomial: $(2x-1)^4$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1

Factoring Polynomials: Factor each polynomial completely.

20. $p^2 - 3p - 40$

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

22. $3b^3 - 6b^2 + 2b - 4$

23. $2k^2 - 5k + 2$

24. $b^2 + 4b$

25. $2x^3 - 2$

26. $4n^4 + 68n^3 + 280n^2$

27. $5x^2 + x - 4$

28. $64a^3 - 27$

29. $n^2 + 6n + 8$

30. $25x^2 - 9$

31. $3x^2 - x - 2$

32. $x^2 - 4$

33. $27x^3 + 1$

34. $x^3 + 125$

35. $v^2 - 11v + 24$

36. $10p^3 + 10p^2 + 15p + 15$

Zeros of Polynomials

37. Are $(x+2)$ and $(x-6)$ factors of $f(x) = 2x^3 + 8x^2 - 22x - 60$?

Find **all** the zeros of the following functions **WITHOUT** a calculator

38. $g(x) = x^3 + 4x^2 + 4x$

39. $h(x) = 3x^3 - 2x^2 - 3x + 2$

40. $f(x) = x^4 + x^3 - 14x^2 - 2x + 24$

41. $k(x) = 7x^3 + x^2 - 28x - 4$

Given the following zeros and multiplicities, write a function in factored form

42. 2 (multiplicity of 3), 5, -7(multiplicity of 2)

43. 4, 2(multiplicity of 5), -3

44. Given $g(x) = 3x^3 - 8x^2 + 3x + 2$, use the rational root theorem to determine which of the following are **possible zeros** of the function.

- a. 2 b. -3 c. 4 d. $-\frac{2}{3}$ e. $\frac{3}{4}$

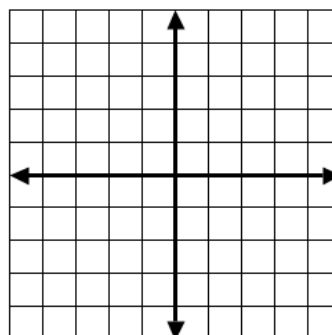
Graphing from Factored Form

For the following functions, find the zeros, state the end behavior using limit notation, and graph the function.

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

zeros:

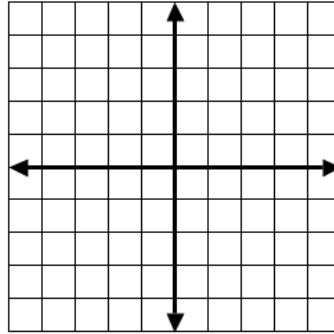
End Behavior:



46. $h(x) = x(x+3)^2(x-2)^3$

zeros:

End Behavior:

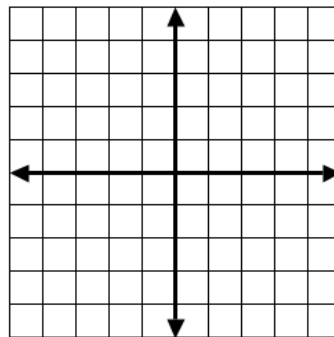


Graphing from Standard Form

47. $f(x) = x^3 - 10x^2 + 14x + 16$

zeros:

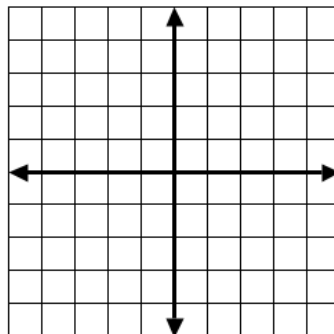
End Behavior:



48. $g(x) = x^4 - 17x^2 + 16$

zeros:

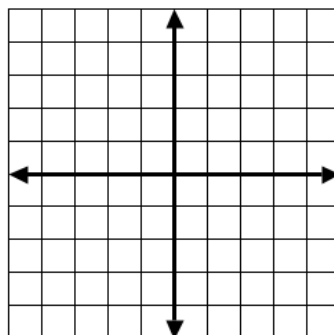
End Behavior:



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

zeros:

End Behavior:



Solving Inequalities

Solve the inequality using a sign chart. Complete factoring if needed. Write your answer in interval notation.

50. $x(x-5)^2(x+3)(2x-1) \geq 0$

51. $x^4 - 5x^3 - 4x^2 + 44x - 48 > 0$, given 2 is a zero (*multiplicity 2*)

52. $(x^2 - 2)(x^2 - 4x + 4) \leq 0$

Complex Numbers

Add or subtract as indicated. Write answer in standard form.

53. $(-3 + \sqrt{-25}) + (4 - \sqrt{-16})$

54. $(-2 + \sqrt{-81}) + (-4 - \sqrt{-64})$

Multiply. Write answers in standard form.

55. $5i(2 - 5i)$

56. $(2 - 3i)(4 + 2i)$

Simplify

57. $\frac{2}{4i}$

58. $\frac{3 - 4i}{2 + i}$

Complex Zeros

Find all the zeros of $f(x)$. Include any multiplicities greater than 1. Classify the roots as real or imaginary.

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

60. $f(x) = x^4 - 81$

Given the zero, find the remaining zeros.

61. $4i, f(x) = x^4 + 13x^2 - 48$

62. $3i, f(x) = x^3 + x^2 + 9x + 9$

63. $-2i, f(x) = x^4 - 3x^3 - 6x^2 - 12x - 40$