

I. Key Vocabulary

end behavior	polynomial function	Factor Theorem
leading coefficient	synthetic division	Rational Root Theorem
local maximum	degree of a polynomial	Irrational Root Theorem
local minimum	Pascal's triangle	Fundamental Theorem of Algebra
multiplicity	Sum and difference of two cubes	
polynomial		

Complex conjugate Root Theorem

II. Exercises

A. Rewrite each polynomial in standard form. Then identify the leading coefficient, degree and number of terms. Name the polynomial.

1. $4x^2 - 3x^3 + 6x + 7$

2. $1 - 11x + 9x^2$

3. $5x^3 - x^5 + 8x + 2x^4$

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

B. Add or subtract. Write your answer in standard form.

5. $(8x^3 - 4x^2 - 3x + 1) - (1 - 5x^2 + x)$

6. $(6x^2 + 7x - 2) + (1 - 5x^3 + 3x)$

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

8. $(x^4 - x^2 + 4) + (x^2 - x^3 - 5x^4 - 7)$

C. Graph each polynomial function on a calculator. Describe the graph, and identify the number of real zeros.

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

10. $f(x) = x^3 + 2x^2 + 1$

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

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

D. Find each product.

13. $5x^2(3x - 2)$

14. $ab^2(a^2 - a + ab)$

15. $(2x+5)(x^3 - x^2 + 1)$

16. $(x + 4)(x^4 - 3x^2 + x)$

17. $-3t(2t^2 - 6t + 1)$

18. $(x - 2)(x^2 - 2x - 3)$

19. $(x - 3)^3$

20. $(2x + 1)^4$

21. A cylinder has a height of $x^2 - x - 3$ and a radius of $2x$. Express the volume of the cylinder as a sum of monomials.

E. Divide by using long division.

22. $(x^3 - 5x^2 + 2x - 7) \div (x + 2)$

23. $(8x^4 + 6x^2 - 2x + 4) \div (2x - 1)$

F. Divide using synthetic division.

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

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

26. A spool of ribbon has a length of $x^3 + x^2$ inches. Write an expression that represents the number of strips of ribbon with a length of $x - 1$ inches that cannot be cut from one spool.

G. Determine whether the given binomial is a factor of the polynomial $P(x)$.

27. $(x + 3)$; $P(x) = x^3 + 2x^2 - 5$

28. $(x - 1)$; $P(x) = 4x^4 - 5x^2 + 3x - 2$

29. $(x - 2)$; $P(x) = 2x^3 - 3x^2 + x - 6$

H. Factor each expression.

30. $x^3 - x^2 - 16x + 16$

31. $3x^3 + 81$

32. $4x^3 - 8x^2 - x + 2$

33. $16x^3 - 2$

I. Identify all the real roots of each equation.

34. $x^3 - 5x^2 + 8x - 4 = 0$

35. $x^3 + 6x^2 + 9x + 2 = 0$

36. $x^3 + 3x^2 + 3x + 1 = 0$

37. $x^4 - 12x^2 + 27 = 0$

38. $x^3 + x^2 - 2x - 2 = 0$

39. $x^3 - 5x^2 + 4 = 0$

40. A rectangular prism has length that is twice its width and height that is 4 meters longer than its width. The volume of the rectangular prism is 48 cubic meters. What is the width of the rectangular prism?

J. Write the simplest polynomial function with the given roots.

41. $-3, 2, 4$

42. $-\frac{1}{2}, -2, 3$

43. $-3, i$

44. $-\sqrt{2}, -1$

45. $\sqrt{2}, \sqrt{3}$

46. $1 + \sqrt{3}, 2i$

K. Solve the equation by finding all the roots.

47. $x^3 - x^2 + 4x - 4 = 0$

48. $x^4 - x^2 - 2 = 0$

49. $x^4 - \frac{63}{4}x^2 - 4 = 0$

50. $x^3 + 3x^2 - 5x - 15 = 0$

L. Identify the leading coefficient, degree and end behavior.

51. $-2x^3 + 5x^2 + 3$

52. $-3x^6 + 9x^3 - 2x - 9$

53. $x^4 + 2x^3 - 3x + 1$

54. $7x^5 + x^4 - 2x^2 + 5$

M. Graph each function.

55. $f(x) = x^3 - x^2 - 5x + 6$

56. $f(x) = x^4 - 10x^2 + 9$

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

