CHAPTER 5 – POLYNOMIAL AND RATIONAL FUNCTIONS

Exercise 1.
In Problems 5–10, graph each function using transformations (shifting, compressing, stretching, and reflection). Show all the stages

5. $f(x) = (x+2)^3$ **6.** $f(x) = -x^3 + 3$ **7.** $f(x) = -(x-1)^4$

8. $f(x) = (x-1)^4 - 2$ **9.** $f(x) = (x-1)^4 + 2$ **10.** $f(x) = (1-x)^3$

Exercise 2.
In Problems 19–22, find the domain of each rational function. Find any horizontal, vertical, or oblique asymptotes.

19. $R(x) = \dfrac{x+2}{x^2-9}$ **20.** $R(x) = \dfrac{x^2+4}{x-2}$ **21.** $R(x) = \dfrac{x^2+3x+2}{(x+2)^2}$ **22.** $R(x) = \dfrac{x^3}{x^3-1}$

Exercise 3.
In Problems 39–44, solve each inequality. Graph the solution set.

39. $\dfrac{2x-6}{1-x} < 2$ **40.** $\dfrac{3-2x}{2x+5} \geq 2$ **41.** $\dfrac{(x-2)(x-1)}{x-3} \geq 0$ **42.** $\dfrac{x+1}{x(x-5)} \leq 0$

43. $\dfrac{x^2-8x+12}{x^2-16} > 0$ **44.** $\dfrac{x(x^2+x-2)}{x^2+9x+20} \leq 0$

Exercise 4.
In Problems 45–48, find the remainder R when $f(x)$ is divided by $g(x)$. Is g a factor of f?

45. $f(x) = 8x^3 - 3x^2 + x + 4;\quad g(x) = x - 1$ **46.** $f(x) = 2x^3 + 8x^2 - 5x + 5;\quad g(x) = x - 2$

47. $f(x) = x^4 - 2x^3 + 15x - 2;\quad g(x) = x + 2$ **48.** $f(x) = x^4 - x^2 + 2x + 2;\quad g(x) = x + 1$

Exercise 5.
In problems 51-52, list all the potential rational zeros of each function
51. $f(x) = 12x^8 - x^7 + 6x^4 - x^3 + x - 3$
52. $f(x) = -6x^5 + x^4 + 2x^3 - x + 1$

Exercise 6.
In Problems 59–62, solve each equation in the real number system.

59. $2x^4 + 2x^3 - 11x^2 + x - 6 = 0$ **60.** $3x^4 + 3x^3 - 17x^2 + x - 6 = 0$

61. $2x^4 + 7x^3 + x^2 - 7x - 3 = 0$ **62.** $2x^4 + 7x^3 - 5x^2 - 28x - 12 = 0$

Exercise 7.
In Problems 67–70, use the Intermediate Value Theorem to show that each polynomial function has a zero in the given interval.

67. $f(x) = 3x^3 - x - 1;\quad [0, 1]$ **68.** $f(x) = 2x^3 - x^2 - 3;\quad [1, 2]$

69. $f(x) = 8x^4 - 4x^3 - 2x - 1;\quad [0, 1]$ **70.** $f(x) = 3x^4 + 4x^3 - 8x - 2;\quad [1, 2]$

Exercise 8.

In Problems 75–78, information is given about a complex polynomial whose coefficients are real numbers. Find the remaining zeros of f. Then find a polynomial function with real coefficients that has the zeros.

75. Degree 3; zeros: $4 + i, 6$

76. Degree 3; zeros: $3 + 4i, 5$

77. Degree 4; zeros: $i, 1 + i$

78. Degree 4; zeros: $1, 2, 1 + i$

Exercise 9.

In Problems 79–86, find the complex zeros of each polynomial function $f(x)$. Write f in factored form

79. $f(x) = x^3 - 3x^2 - 6x + 8$

80. $f(x) = x^3 - x^2 - 10x - 8$

81. $f(x) = 4x^3 + 4x^2 - 7x + 2$

82. $f(x) = 4x^3 - 4x^2 - 7x - 2$

83. $f(x) = x^4 - 4x^3 + 9x^2 - 20x + 20$

84. $f(x) = x^4 + 6x^3 + 11x^2 + 12x + 18$

85. $f(x) = 2x^4 + 2x^3 - 11x^2 + x - 6$

86. $f(x) = 3x^4 + 3x^3 - 17x^2 + x - 6$

Exercise 10.

Design a polynomial function with the following characteristics: degree 6; four real zeros, one of multiplicity 3; y-intercept 3; behaves like $y = -5x^6$ for large values of $|x|$. Is this polynomial unique?

Exercise 11.

Design a rational function with the following characteristics: three real zeros, one of multiplicity 2; y-intercept 1; vertical asymptotes $x = -2$ and $x = 3$; oblique asymptote $y = 2x + 1$. Is this rational function unique?

HOMEWORKS

Exercise 1: 6, 8
Exercise 2: 20, 22
Exercise 3: 40, 42
Exercise 4: 46, 48
Exercise 5: 52
Exercise 6: 60, 62
Exercise 7: 68, 70
Exercise 8: 76,78
Exercise 9: 80,82
Exercise 10
Exercise 11