

Notes Section 4.2

**Dividing Polynomials:**

**Divide polynomials using long division**

**Divide polynomials using synthetic division**

**Use the Remainder Theorem to evaluate functions**

1-4 Two polynomials P and D are given.

(a) Divide  $P(x)$  by  $D(x)$

(b) Express P in the form :  $P(x) = D(x) \cdot Q(x) + R(x)$

2.  $P(x) = x^3 + 4x^2 - 6x + 1, D(x) = x - 1$

4.  $P(x) = 2x^5 + 4x^4 - 4x^3 - x - 3, D(x) = x^2 - 2$

5-14 Find the quotient and remainder using long division.

10. 
$$\frac{3x^4 - 5x^3 - 20x - 5}{x^2 + x + 3}$$

5. 
$$\frac{x^3 + 6x + 3}{x^2 - 2x + 2}$$

Synthetic Division:

Step 1: Write the coefficients in descending order

Step 2: Write the constant  $r$  of the divisor  $x - r$  to the left.

Step 3: Bring down the first coefficient

Step 4: Multiply the first coefficient by  $r$ .

Write the product under the second coefficient.

Step 5: Add the product and the second coefficient

Step 6: Repeat steps 4 and 5 with remaining coefficients.

15-28 Find the quotient and remainder using synthetic division.

15. 
$$\frac{x^2 - 5x + 4}{x - 3}$$

21. 
$$\frac{x^3 - 8x + 2}{x + 3}$$

23. 
$$\frac{x^5 + 3x^3 - 6}{x - 1}$$

26. 
$$\frac{6x^4 + 10x^3 + 5x^2 + x + 1}{x + \frac{2}{3}}$$

**Remainder Theorem:**

If the polynomial  $P(x)$  is divided by  $x - c$ , then the remainder is the value of  $P(c)$

29-41 Use synthetic division and the Remainder Theorem to evaluate  $P(c)$

34.  $P(x) = 2x^3 - 21x^2 + 9x - 200, \quad c = 11$

35.  $P(x) = 5x^4 + 30x^3 - 40x^2 + 36x + 14, \quad c = -7$

**Factor Theorem:**

$c$  is a zero of  $P$  if and only if  $x - c$  is a factor of  $P(x)$ .

43-46 Use the Factor Theorem to show that  $x - c$  is a factor of  $P(x)$  for the given value(s) of  $c$ .

44.  $P(x) = x^3 + 2x^2 - 3x - 10, \quad c = 2$

47.  $P(x) = x^3 + 2x^2 - 3x - 10, \quad c = 2$

49-52 Find a polynomial of the specified degree that has the given zeros.

52. Degree 5; zeros  $-2, -1, 0, 1, 2$

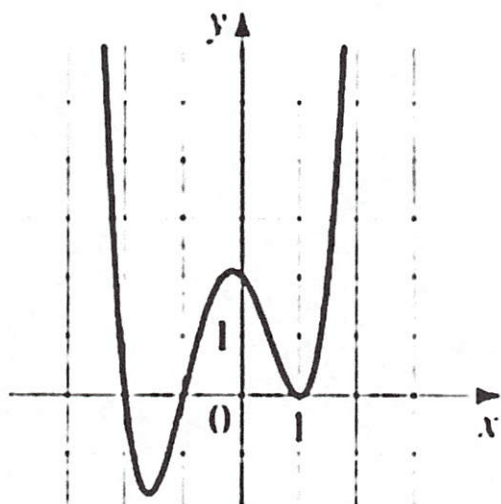
51. Degree 4; zeros  $-1, 1, 3, 5$

55-58

Find the polynomial of the specified degree whose graph is shown.

58.

Degree



57.

Degree 4

