4.6 Division of Polynomials

1. Divide a Polynomial by a Monomial

Now let's see how to divide polynomials. We begin by dividing a polynomial by a monomial.

**To Divide a Polynomial by a Monomial**

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

**EXAMPLE 1**

Divide:

a) \( \frac{4x + 20}{4} \)

\[ \frac{4x}{4} + \frac{20}{4} = x + 5 \]

b) \( \frac{9x^2 - 6x}{3x} \)

\[ \frac{9x^2}{3x} - \frac{6x}{3x} = 3x - 2 \]

\[ \frac{12 + 2 + 6}{2} = \frac{20}{2} = 10 \]

\[ \frac{12}{2} + \frac{3}{2} + \frac{6}{2} \]

\[ \frac{6 + 1 + 3}{10} \]

38. \( \frac{9x^2 + 18x - 7}{-9} \)

\[ -\frac{9x^2}{-9} + \frac{18x}{-9} + \frac{-7}{-9} \]

\[ -x^2 - 2x + \frac{7}{9} \]

42. \( \frac{-15m^3 - 6m^2 + 15}{-5m^3} \)

\[ -\frac{15m^3}{-5m^3} - \frac{6m^2}{-5m^3} + \frac{15}{-5m^3} \]

\[ + 3 + \frac{6}{5m} - \frac{3}{m^3} \]
# Interest = Principle \times Rate \times Time

<table>
<thead>
<tr>
<th>Amount of Money</th>
<th>Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>0.11</td>
<td>0.11X</td>
</tr>
<tr>
<td>19000 - x</td>
<td>0.12</td>
<td>0.12(19000 - x)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2200</td>
</tr>
</tbody>
</table>

Interest Earned is 2200

0.11X + 0.12(19000 - x) = 2200
2 Divide a Polynomial by a Binomial

We divide a polynomial by a binomial in much the same way as we perform long division. This procedure will be explained in Example 4.

**EXAMPLE 4**  Divide \( \frac{x^2 + 6x + 8}{x + 2} \).

**Solution**  Rewrite the division problem in the following form:

\[
\frac{x^2 + 6x + 8}{x + 2}.
\]

44. \( (2x^2 + 3x - 35) \div (x + 5) \)

66. \( \frac{x^2 + 64}{x + 4} \)
58. \[ \frac{x^3 + 5x^2 + 2x - 8}{x + 2} \]
To Check Division of Polynomials

(divisor \times quotient) + remainder = dividend

Let’s check the answer to Example 6. The divisor is $2x + 3$, the quotient is $3x - 7$, the remainder is $26$, and the dividend is $6x^2 - 5x + 5$.

Check

(divisor \times quotient) + remainder = dividend

$(2x + 3)(3x - 7) + 26 = 6x^2 - 5x + 5$

$(6x^2 - 5x - 21) + 26 = 6x^2 - 5x + 5$

$6x^2 - 5x + 5 = 6x^2 - 5x + 5 \quad \text{True}$