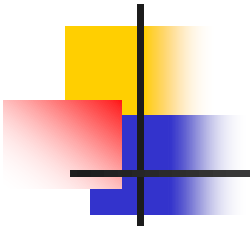

Dividing Polynomials
11.5

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{3s^2}{3s} + \frac{3s}{3s} - \frac{9}{3s}$$

b. $4x^2 - 6x + 8 \div 2x$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{\overset{s}{\cancel{3}}s^2}{\underset{1}{\cancel{3}}s} + \frac{3s}{3s} - \frac{9}{3s}$$

b. $4x^2 - 6x + 8 \div 2x$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{\cancel{3}s^{\cancel{2}}}{\cancel{3}s_{1}} + \frac{\cancel{3}s^{1}}{\cancel{3}s_{1}} - \frac{9}{3s}$$

b. $4x^2 - 6x + 8 \div 2x$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{3s^2}{3s} + \frac{3s}{3s} - \frac{9}{3s}$$

$$s + 1 - \frac{3}{s}$$

b. $4x^2 - 6x + 8 \div 2x$

$$\frac{4x^2}{2x} - \frac{6x}{2x} + \frac{8}{2x}$$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{3s^2}{3s} + \frac{3s}{3s} - \frac{9}{3s}$$

$$s + 1 - \frac{3}{s}$$

b. $4x^2 - 6x + 8 \div 2x$

$$\frac{4x^2}{2x} - \frac{6x}{2x} + \frac{8}{2x}$$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{3s^2}{3s} + \frac{3s}{3s} - \frac{9}{3s}$$

$$s + 1 - \frac{3}{s}$$

b. $4x^2 - 6x + 8 \div 2x$

$$\frac{4x^2}{2x} - \frac{6x}{2x} + \frac{8}{2x}$$

Dividing a Polynomial by a Monomial

- Divide each term in the polynomial by the monomial.

a. $3s^2 + 3s - 9 \div 3s$

$$\frac{3s^2}{3s} + \frac{3s}{3s} - \frac{9}{3s}$$

$$s + 1 - \frac{3}{s}$$

b. $4x^2 - 6x + 8 \div 2x$

$$\frac{4x^2}{2x} - \frac{6x}{2x} + \frac{8}{2x}$$

$$2x - 3 + \frac{4}{x}$$

On Your Own

Find the quotient.

1. $(4z^2 - 18z) \div 2z$ $2z - 9$

2. $(n^2 - 4n + 8) \div n$ $n - 4 + \frac{8}{n}$

3. $(y^3 - 4y^2 + 9y) \div 4y$ $\frac{y^2}{4} - y + \frac{9}{4}$

Dividing a Polynomial by a Binomial: No Remainder

- You can use long division to divide a polynomial by a binomial.

Find $(s^2 - 2s - 8) \div (s + 2)$.

Step 1: Divide the first term of dividend by first term of the divisor.

$$\begin{array}{r} s \\ s+2\overline{)\,s^2-2s-8} \\ -(s^2+2s) \\ \hline -4s-8 \end{array}$$

Divide: $s^2 \div s = s$

Multiply: $s(s+2)$

Subtract. Bring down -8

Step 2: Divide the first term of $-4s - 8$ by first term of the divisor.

$$\begin{array}{r} s\ -4 \\ s+2\overline{)\,s^2-2s-8} \\ -(s^2+2s) \\ \hline -4s-8 \\ -(-4s-8) \\ \hline 0 \end{array}$$

Multiply: $-4(s+2)$
Subtract.

Dividing a Polynomial by a Binomial: No Remainder

- You could have also factored out $s^2 - 2s - 8$ and divided out a common factor. .

$$\frac{(\boldsymbol{s-4})(\boldsymbol{s+2})}{s+2} = s - 4$$

Dividing a Polynomial by a Binomial: Remainder

When you use long division to divide polynomials and you obtain a nonzero remainder, use the following rule.

$$\text{Dividend} \div \text{Divisor} = \text{Quotient} + \frac{\text{Remainder}}{\text{Divisor}}$$

Find $(2 - 7y + y^2) \div (y - 3)$.

$$\begin{array}{r} y - 4 \\ y - 3 \overline{)\, y^2 - 7y + 2} \\ \underline{-(y^2 - 3y)} \\ -4y + 2 \\ \underline{-(-4y + 12)} \\ -10 \end{array}$$

So, $(2 - 7y + y^2) \div (y - 3) = y - 4 - \dfrac{10}{y - 3}$.

On Your Own

Find the quotient.

4. $(s^2 - 3s - 28) \div (s - 7)$ $s + 4$

5. $(x^2 + 4x - 5) \div (2 + x)$ $x + 2 - \frac{9}{x + 2}$

Inserting a Missing Term

- When dividing polynomials using long division, first write the polynomials in standard form and insert any missing terms..

Find $(2s^2 - 4) \div (s - 2)$.

$$
\begin{array}{r}
2s + 4 \\
s - 2 \overline{)\ 2s^2 + 0s - 4} \\
\underline{-(2s^2 - 4s)} \\
4s - 4 \\
\underline{-(4s - 8)} \\
4
\end{array}
$$

So, $(2s^2 - 4) \div (s - 2) = 2s + 4 + \frac{4}{s-2}$

On Your Own

Find the quotient.

6. $(z^2 + 6) \div (z + 9)$ $\quad z - 9 + \dfrac{87}{z + 9}$

7. $(9y^2 - 4) \div (3y + 2)$ $\quad 3y - 2$