

Section 5.6 - multiplying and dividing a polynomial by a monomial

recall, $x \cdot x = x^2$ means multiply $b \cdot b = b^2$
 $x \cdot x \cdot x = x^3$ $b \cdot b \cdot b = b^3$
 $x \cdot x \cdot x \cdot x = x^4$

* multiplying with exponents we add exponents.

$$(-x) \cdot x = -x^2 \quad (5r)(6r) = 30r^2$$

$$(-x) \cdot (-x) = x^2 \quad (-5v)(-9v) = 45v^2$$

$$(-2x) \cdot (x) = -2x^2$$

Examples: ① $3e(4e-2)$
 $= 12e^2 - 6e$

② $-6x(-7x+5)$
 $= 42x^2 - 30x$

* to divide a polynomial by a monomial, we use what we already know about division.

recall, $x^4 \div x^2 = x^2$ $x^5 \div x^2 = x^3$
 $x^3 \div x = x^2$

* when dividing with exponents you subtract the exponents.

Examples: ① $\frac{6a^2}{3a}$ $\left\{ \begin{array}{l} \frac{6}{3} \quad \frac{a \cdot a}{a} \\ 2 \quad a \end{array} \right.$
 $= 2a$

② $\frac{-8x^2 + 6x}{-2x}$ * break up the fraction into 2 parts.
 $= \frac{-8x^2}{-2x} + \frac{6x}{-2x}$ $\frac{x^1}{x^1} = x^0 = 1$
 $= 4x - 3$

③ $\frac{12a^2}{-6a}$ $\frac{12 \cdot a}{a}$
 $= -2a$

④ $\frac{9y^2 + 3y}{3y}$
 $= \frac{9y^2}{3y} + \frac{3y}{3y}$
 $= 3y + 1$

$$\begin{aligned} \textcircled{5} \quad & \frac{-14c^2 + 21c}{-7c} \\ & = \frac{-14c^2}{-7c} + \frac{21c}{-7c} \\ & = 2c - 3 \end{aligned}$$

more good examples:

evaluate: $\textcircled{1}$ $x+3$ when $x=5$
 $5+3=8$

$\textcircled{2}$ $2x^3 + 1 - (x+1)$ when $x=-2$
 $= 2(-2)^3 + 1 - (-2+1)$
 $= 2(-8) + 1 - (-1)$
 $= -16 + 1 + 1$
 $= -14$

$$\begin{aligned}
 \textcircled{3} \quad & (x^2 + 5x + 6) - (x - 3) \text{ when } x = 2 \\
 & = [(2)^2 + 5(2) + 6] - (2 - 3) \\
 & = (4 + 10 + 6) - (-1) \\
 & = 20 + 1 \\
 & = 21
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{4} \quad & 2x^2(x - 6) \text{ when } x = 10 \\
 & = 2(10)^2(10 - 6) \\
 & = 2(100)(4) \\
 & = 800
 \end{aligned}$$

⑤ If the area of a rectangle is $4x^2 - 2x$ and the width is $2x$. What is the length?

$$\begin{aligned}
 & \frac{4x^2 - 2x}{2x} \\
 & = \frac{4x^2}{2x} - \frac{2x}{2x} \\
 & = 2x - 1
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{6} \quad & \frac{-12x^6y^8}{6x^3y^4} \\
 & = -2x^3y^4
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{7} \quad & x(x-1) - (x^2 - 2x + 3) \\
 & = x^2 - x - x^2 + 2x - 3 \\
 & = x - 3
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{8} \quad & \frac{6x^3 + 4x^3}{2x^2} \text{ when } x = 3 \\
 & = \frac{10^3}{2x^2} \\
 & = 5x \\
 & = 5(3) \\
 & = 15
 \end{aligned}$$