

**Topic:** Synthetic Division

**Name:** \_\_\_\_\_

**What am I learning today?**

**Warm Up**

*Simplify.*

1)  $(8 - 3x^4 - 2x) + (x^4 - 4x^3 + 6)$

$= 8 - 3x^4 - 2x + x^4 - 4x^3 + 6$   
 $= -2x^4 - 4x^3 - 2x + 14$

3)  $4x(2x^2 - 4x + 1)$   
 $= 8x^3 - 16x^2 + 4x$

2)  $(3x^2 + 1) - (-4x^2 + 5)$

$= 3x^2 + 1 + 4x^2 - 5$   
 $= 7x^2 - 4$

4)  $(2x + 1)(-3x + 7)$   
 $= -6x^2 + 14x - 3x + 7$   
 $= -6x^2 + 11x + 7$

*Put the following polynomials in standard form.*

1)  $2x^3 + 3x^5 + 1 - 5x$

2)  $4x + 2x^3 + 7x^2 - 1$

**Notes**  
Synthetic Division

You can divide polynomials by using a method called Synthetic division.

EX.  $(3x^3 - 10x - 25) \div (x - 1)$

Steps

1) Put polynomial in standard form.

2) Check for missing terms. Replace any missing terms with 0.

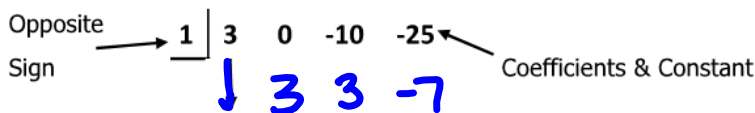
EX.  $3x^3 - 10x - 25$  is missing the  $x^2$  term.

Polynomial WITH the missing term  $3x^3 + 0x^2 - 10x - 25$

3) Set up: Use the divisor & coefficients for the top row.

The number in the box on the outside is called a divisor, it is what you are dividing by. In this example, we are dividing by  $(x - 1)$ . Always use the opposite

sign when what you are dividing by is written in the form  $(x + \#)$  or  $(x - \#)$ .



4) Divide: 3 3 -7 | -32 ← Remainder

Bring down the first term.

MULTIPLY the numbers on the bottom by the number in the box. Place the answer above the line and, then ADD the numbers above the line. Repeat.

5) For the final answer insert exponent and variable. We start with one less exponent than the original problem. The last # is the remainder. Write the remainder as a fraction.

$$\begin{array}{r} 3x^2 + 3x - 7 - 32 \\ \hline x - 1 \end{array}$$

Topic: Operations w/Polynomials

Examples

Divide

$$\begin{array}{r} x+1 \overline{) 0} \\ -x \phantom{-1} \\ \hline x = \boxed{-1} \end{array}$$

Examples:  $2x^2 + 0x - 4$  divisor  $x+1$   
 Ex 1:  $(2x^2 - 4) \div (x + 1)$

$$\begin{array}{r} -1 \overline{) 2 \quad 0 \quad -4} \\ \phantom{-1} \downarrow -2 \quad 2 \\ \hline 2 \quad -2 \quad -2 \\ \phantom{-1} \phantom{2} \phantom{-2} \phantom{-2} \\ \hline 2x - 2 - \frac{2}{x+1} \end{array}$$

Date: \_\_\_\_\_  
 $x^3 - 6x^2 - 21x - 54$   
 Ex 2:  $(-21x + x^3 - 54 - 6x^2) \div (x - 9)$

$$\begin{array}{r} 9 \overline{) 1 \quad -6 \quad -21 \quad -54} \\ \phantom{9} \downarrow 9 \quad 27 \quad 54 \\ \hline 1 \quad 3 \quad 6 \quad 0 \\ \phantom{9} \phantom{1} \phantom{3} \phantom{6} \phantom{0} \\ \hline x^2 + 3x + 6 + \frac{0}{x-9} \end{array}$$

You Try:

1)  $(-5x^3 - 16x - 17x^2 + 30) \div (x - 3)$

$$\begin{array}{r} 3 \overline{) -5 \quad -17 \quad -16 \quad 30} \\ \phantom{3} \downarrow -15 \quad -46 \quad -336 \\ \hline -5 \quad -32 \quad -112 \quad -306 \\ \phantom{3} \phantom{-5} \phantom{-32} \phantom{-112} \phantom{-306} \\ \hline -5x^2 - 32x - 112 - \frac{306}{x-3} \end{array}$$

2)  $(x^3 + 4x^2 - 7x + 2) \div (x - 1)$

$$\begin{array}{r} 1 \overline{) 1 \quad 4 \quad -7 \quad 2} \\ \phantom{1} \downarrow 1 \quad 5 \quad -2 \\ \hline 1 \quad 5 \quad -2 \quad 0 \\ \phantom{1} \phantom{1} \phantom{5} \phantom{-2} \phantom{0} \\ \hline x^2 + 5x - 2 + \frac{0}{x-1} \end{array}$$

3)  $(x^3 - 10x^2 + 5) \div (x - 10)$

$$\begin{array}{r} 10 \overline{) 1 \quad -10 \quad 0 \quad 5} \\ \phantom{10} \downarrow 10 \quad 0 \quad 0 \\ \hline 1 \quad 0 \quad 0 \quad 5 \\ \phantom{10} \phantom{1} \phantom{0} \phantom{0} \phantom{5} \\ \hline x^2 + \frac{5}{x-10} \end{array}$$

3)  $(x^3 + 12x^2 + 23x - 18) \div (x + 3)$

$$\begin{array}{r} -3 \overline{) 1 \quad 12 \quad 23 \quad -18} \\ \phantom{-3} \downarrow -3 \quad -27 \quad 12 \\ \hline 1 \quad 9 \quad -4 \quad -6 \\ \phantom{-3} \phantom{1} \phantom{9} \phantom{-4} \phantom{-6} \\ \hline x^2 + 9x - 4 - \frac{6}{x+3} \end{array}$$

Summary

Summarize the lesson in your own words