Warm Up.

Use long division to find the quotient.

$$\begin{array}{r} 11882\tfrac{3}{5} \\ 5\overline{)59413} \\ -\underline{55} \\ 44 \\ -\underline{40} \\ 41 \\ \underline{40} \\ 13 \\ -\underline{10} \\ 3 \end{array}$$

3 ← remainder

11882.6

Section 6.2D

Polynomial Long Division has a process that is parallel to the process for long division you learned in elementary school. To help refresh your memory, let's take a look at a long division problem that you might have done as an elementary student.

$$\begin{array}{r} 3{,}524 \text{ R } 6 \\ 24\overline{)85{,}582} \\ \underline{72} \\ \cancel{13}5 \\ \underline{12\,0} \\ 58 \\ \underline{48} \\ 102 \\ \underline{96} \\ 6 \end{array} \qquad \begin{array}{r} 3565\text{R}22 \\ 24\overline{)85582} \\ \underline{72} \\ 135 \\ \underline{120} \\ 158 \\ \underline{144} \\ 142 \\ \underline{120} \\ 22 \end{array}$$

dividend ÷ divisor = quotient

VOCAB → $\dfrac{\text{dividend}}{\text{divisor}}$ = quotient

This exact same process works when dividing two polynomials. Let's take a look at an example.

Example: $\underbrace{(6x^2-2x-28)}_{\text{dividend}} \div \underbrace{(2x+4)}_{\text{divisor}}$

Solution:

	Description of step	Step by step method of Long Division
1)	Consider both the leading terms of the dividend and divisor.	$\begin{array}{r} 3x \\ 2x+4\overline{)6x^2-2x-28} \end{array}$ $\dfrac{6x^2}{2x}=3x$
2)	Divide the leading term of the dividend by the leading term of the divisor.	
3)	Place the partial quotient on top.	
4)	Now take the partial quotient you placed on top, **3*x***, and distribute into the divisor **(2*x* + 4)**.	$\begin{array}{r} 3x \\ 2x+4\overline{)6x^2-2x-28} \\ 6x^2+12x \end{array}$ $[(3x)(2x+4)]$ $6x^2+12x$
5)	Position the product of **(3*x*)** and **(2*x* + 4)** under the dividend. • *Make sure to align them by similar terms.*	

6)	Performing subtraction will switch the signs of the bottom polynomial.	$\begin{array}{r} 3x \\ 2x+4\overline{)6x^2-2x-28} \\ -(6x^2+12x) \end{array}$
7)	Proceed with regular addition vertically. • *Notice that the first column from the left cancels each other out. Nice!*	$\begin{array}{r} 3x \\ 2x+4\overline{)\cancel{6x^2}-2x-28} \\ \cancel{-6x^2}-12x \\ \hline -14x \end{array}$
8)	Carry down the next adjacent "unused" term of the dividend.	$\begin{array}{r} 3x \\ 2x+4\overline{)6x^2-2x-28} \\ -6x^2-12x \downarrow \\ \hline -14x-28 \end{array}$

9)	Next, look at the bottom polynomial, **−14x−28**, take its leading term which is **−14x** and divide it by the leading term of the divisor, **2x**.	$\begin{array}{r} 3x-7 \\ 2x+4\overline{)6x^2-2x-28} \\ -6x^2-12x \\ -14x-28 \end{array}$ $\frac{-14x}{2x}=-7$
10)	Again, place the partial quotient on top.	
11)	Use the partial quotient that you put up, **−7**, and distribute into the divisor. Seeing a pattern now?	$\begin{array}{r} 3x-7 \\ 2x+4\overline{)6x^2-2x-28} \\ -6x^2-12x \\ -14x-28 \end{array}$ $[(-7)(2x+4)]$ $-14x-28$
12)	Place the product of **−7**and the divisor below as the last line of polynomial entry.	
13)	Performing subtraction will switch the signs of the bottom polynomial.	$\begin{array}{r} 3x-7 \\ 2x+4\overline{)6x^2-2x-28} \\ -6x^2-12x \\ -14x-28 \\ -(-14x-28) \end{array}$

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14)	Perform regular addition along the columns of similar terms	$\begin{array}{r} 3x-7 \\ 2x+4\overline{)6x^2-2x-28} \\ -6x^2-12x \\ -\cancel{14x}-\cancel{28} \\ +\cancel{14x}+\cancel{28} \\ 0 \end{array}$ ← remainder
15)	This is great because the remainder is zero. It means the divisor is a factor of the dividend. The final answer is just the stuff on top of the division symbol.	$(6x^2-2x-28) \div (2x+4) = \boxed{3x-7}$ dividend ÷ divisor = quotient

CHECK: $(2x+4)(3x-7)$

$6x^2-14x+12x-28$

$6x^2-2x-28$ ✓

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#1 – 12: Divide the following polynomials.

1) $\left(v^4+11v^3+22v^2+28v-72\right) \div (v+9)$ 2) $\left(x^3-x^2-60x+32\right) \div (x-8)$

dividend divisor

$$v^3+2v^2+4v-8$$

$$v+9\,\big)\,\cancel{v^4}+11v^3+22v^2+28v-72$$

$$-\left(\cancel{v^4}+9v^3\right)$$

$$\cancel{2v^3}+22v^2$$

$$-\left(\cancel{2v^3}+18v^2\right)$$

$$\cancel{4v^2}+28v$$

$$-\left(\cancel{4v^2}+36v\right)$$

$$\cancel{-8v}-72$$

$$-\left(\cancel{-8v}-72\right)$$

$$0 \leftarrow \text{remainder}$$

$\dfrac{v^4}{v}=v^3$

$\dfrac{2v^3}{v}=2v^2$

$\dfrac{4v^2}{v}=4v$

$\dfrac{-8v}{v}=-8$

$$\boxed{\text{Quotient: } v^3+2v^2+4v-8}$$

#1 – 12: Divide the following polynomials.

11) $\dfrac{\left(x^5-7x^4+21x^3+22x^2-9x-18\right)}{x^2+x-3}$ 12) $\dfrac{\left(7n^4-51n^3-53n^2+300n+18\right)}{n^2-6}$

$$7n^2-51n-11-\frac{6n-48}{n^2-6}$$

$$n^2+0n-6\,\big)\,\cancel{7n^4}-51n^3-53n^2+300n+18$$

$$-\left(\cancel{7n^4}+0n^3-42n^2\right)$$

$$\cancel{-51n^3}-11n^2+300n$$

$$-\left(\cancel{-51n^3}+0n^2+306n\right)$$

$$\cancel{-11n^2}-6n+18$$

$$-\left(\cancel{-11n^2}+0n+66\right)$$

$$-6n-48$$

Remainder

$\dfrac{7n^4}{n^2}=7n^2$

$\dfrac{-51n^3}{n^2}=-51n$

$\dfrac{-11n^2}{n^2}=-11$

$$\boxed{\text{Quotient: } 7n^2-51n-11-\frac{6n-48}{n^2-6}}$$

UNIT 6: Intermediate Algebra B **Name:** ____________________ **Period:** ______

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Use this guide to help you evaluate where you are at in this chapter, and identify areas that you need extra help in.
☺=Proficient (you are awesome at this) 😐=Middle (you need some improvement) ☹=Not Proficient (HELP!)

Intermediate Algebra Unit 6 : Solving Polynomial functions					
Date Covered	**LT Letter**	**Learning Target (LT)** (What you should know)	**Practice Problems**	**Number of Test Questions/Points**	**Self-Evaluation** (Do you know it?)
5/1	6.1 A & 6.1 B	I graph polynomial functions and identify the significant features of the graph.	6.1 A #1, 4-6 (P-77) 6.1 B #1-13 (P-83)		☹ 😐 ☺
5/4 5/5	6.2 A		6.2 A #1-15 (P-93) Exponent w.s.(green)		☹ 😐 ☺
5/6	6.2 B & 6.2C	I can demonstrate understanding of operations with polynomials.	6.2 B #3-15(odds), 21, 22 (P-95) 6.2 C #2-22(evens)		☹ 😐 ☺
5/7	6.2 D		6.2 D ~~#1-9~~ #1,4,5,6,7 (P-105)		☹ 😐 ☺
5/8	6.2 E		6.2 E #1-7, 12, 13 (P-109)		