SM 3H

DATE: 8/25/23 SECTION: 1.3

OBJECTIVE: I can divide polynomials using long division or synthetic division.

Review:

1.) $5x^3(x-4)$

$5x^4-20x^3$

2.) $(x-2)-(x+7)$

-9

3.) $x \cdot \boxed{7x} = 7x^2$

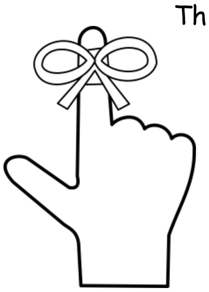
4.) $2x \cdot \boxed{} = 20x^3$

5.) $3x \cdot \boxed{} = -3x^2$

6.) $2997 \div 5$ (no calculator)

Steps for Long Division with Polynomials

1. set ÷ eq. divisor $\overline{)\text{dividend}}$
   denom num
2. use 1st term of each & divide, put ans. on top of like term
3. mult ans in step 2 to divisor, put ans. under like terms
4. subtract ☆ distribute subt ☆
5. bring down next term
6. repeat steps 2-5 with each term
7. write remainder as fraction



Things to remember when dividing polynomials:

a. Just like long division with numbers

b. Must be in standard form

c. put in 0 in place of any missing term x^2-4 → x^2+0x-4

d. distribute subtraction

e. Remainders

Examples: Divide using long division. Write remainders as a fraction in polynomial form.

7.) $\dfrac{x^3+6x^2-x-3}{x+5}$

$$\boxed{x^2+x-6+\frac{27}{x+5}}$$

$x+5\,\overline{)\,x^3+6x^2-x-3}$

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

x^2-x

$-(x^2+5x)$

$-6x-3$

$+6x+30$

27

8.) $\dfrac{3x^3-5x^2+10x-3}{3x+1}$

$$x^2-2x+4+\frac{-7}{3x+1}$$

$3x+1\,\overline{)\,3x^3-5x^2+10x-3}$

$-(3x^3+x^2)$

$-6x^2+10x$

$+6x^2+2x$

$12x-3$

$-(12x+4)$

-7

9.) $(2x^3-9x^2+15)\div(2x-5)$

$$x^2-2x-5-\frac{10}{2x-5}$$

$2x-5\,\overline{)\,2x^3-9x^2+0x+15}$

$-(2x^3-5x^2)$

$-4x^2+0x$

$+4x^2-10x$

$-10x+15$

$+10x-25$

-10

10.) $(1+2x+3x^3+4x^4)\div(x^2+x+2)$

$$4x^2-x-7+\frac{11x+15}{x^2+x+2}$$

$x^2+x+2\,\overline{)\,4x^4+3x^3+0x^2+2x+1}$

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

$-x^3-8x^2+2x$

$+x^3+x^2+2x$

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

$+7x^2+7x+14$

$11x+15$

****Long division works: all the time

****Synthetic division works: divisor is binomial

Steps for Synthetic Division with Polynomials

1. write zero in divisor + coef in dividend
   - use place holders
2. bring down 1st coef
3. mult step 2 with divisor, write ans. under next coef
4. add coef + ans. from step 3, write under
5. repeat step 2-4
6. write variables back + remainder

Examples: Divide using synthetic division. Write remainders as a fraction in polynomial form.

11.) $\frac{4x^2-2x+3}{x-1}$

$x-1=0$
$x=1$

$$\begin{array}{r|rrr} 1 & 4 & -2 & 3 \\ & & 4 & 2 \\ \hline & 4 & 2 & 5 \end{array}$$

remainder

$x^3 \quad x^2 \quad x \quad x^0$

$4x+2+\frac{5}{x-1}$

12.) $\frac{x^3-1}{x-1}$

$$\begin{array}{r|rrrr} 1 & 1 & 0 & 0 & -1 \\ & & 1 & 1 & 1 \\ \hline & 1 & 1 & 1 & 0 \end{array}$$

no R

x^2+x+1

13.) $\frac{2x^3+3x^2-x-3}{x+2}$

14.) $\frac{x^4+5x^3-x^2-19x+8}{x+3}$

15.) $\frac{2x^4+x-30}{x-2}$

16.) $\frac{3x^3-5x^2-3x-2}{3x-1}$

$3x-1=0$

$-4\frac{1}{3}$

$$\begin{array}{r|rrrr} \frac{1}{3} & 3 & -5 & -3 & -2 \\ & & 1 & -\frac{4}{3} & -\frac{13}{9} \\ \hline & 3 & -4 & -\frac{13}{3} & -\frac{31}{9} \end{array}$$

$-2-1\frac{4}{9}$

$-3\frac{4}{9}$

$3x^2-4x-\frac{13}{3}-\frac{\frac{31}{9}}{3x-1}$

Factor Theorem: if no Remainder it is factor

Review of distance formula and midpoint formula

Distance formula: $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

Example: Find the distance between the points. Leave your answers in simplest radical form.

$(4,-5)$ and $(-8,-1)$

$\sqrt{(4+8)^2+(-5+1)^2}$

$\sqrt{144+16}=\sqrt{160}$

$4\sqrt{10}$

Midpoint formula:

Example: Find the midpoint of the line segment with the given endpoints. Leave you answers as simplified fractions. $(6,-2)$ and $(5,8)$

$\left(\frac{6+5}{2},\frac{-2+8}{2}\right)=\left(\frac{11}{2},3\right)$