Chapter 6 Calendar

Name: ____________________

Day	Date	Assignment (Due the next class meeting)
Friday Monday	11/17/23 (A) 11/20/23 (B)	6.1 Worksheet Adding/subtracting & Multiplying polynomial functions
Tuesday Monday	11/21/23 (A) 11/27/23 (B)	6.2 Worksheet Factoring polynomials
Tuesday Wednesday	11/28/23 (A) 11/29/23 (B)	6.3 Worksheet Polynomial division, remainder and factor theorems
Thursday Friday	11/30/23 (A) 12/1/23 (B)	6.4 Worksheet Rational Roots Theorem
Monday Tuesday	12/4/23 (A) 12/5/23 (B)	6.5 Worksheet Graphing polynomial functions day 1
Wednesday Thursday	12/6/23 (A) 12/7/23 (B)	Chapter 6 Practice Test
Friday Monday	12/8/23 (A) 12/11/23 (B)	**Ch 6 TEST** 1st Semester Review Packet
Tuesday Wednesday	12/12/23 (A) 12/13/23 (B)	**Review Day**
Thursday Friday	12/14/23 (A) 12/15/23 (B)	**PRACTICE FINAL**
Monday	12/18/23 (C)	**Review Day**
Tuesday Wednesday Thursday	12/19/23 12/20/23 12/21/23	**FINALS**

- Be prepared for daily quizzes.
- Every student is expected to do every assignment for the entire unit.
- Students who complete *every assignment* for this semester are eligible for a 2% semester grade bonus and a pizza lunch paid by the math department.
- Try www.khanacademy.org or www.mathguy.us (Earl's website) if you need help.

6.1 Notes: Adding, Subtracting, & Multiplying Polynomials

Work with a partner to perform the indicated operation. Be prepared to share with the class.

1) Add: $2x^3 - 5x^2 + 3x - 9$ and $x^3 + 6x^2 + 11$

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

3) Subtract: $5z^2 - z + 3$ from $4z^2 + 9z - 12$

4) $-(t^2 - 6t + 2) - (5t^2 - t - 8)$

5) $-2 + 3(t^2 - 6t + 2) + 4(5t^2 - t - 8) - (6t + 1)$

6) $20 - \frac{1}{2}(-6t^2 + 8t - 4) - 3(t^2 - 6t + 5) + (t - 3)$

7) According to data from the U.S. Census Bureau for the period 2000-2007, the number of male students enrolled in high school in the United States can be approximated by the function $M(x) = -0.004x^3 + 0.037x^2 + .049x + 8.11$ where x is the number of years since 2000 and $M(x)$ is the number of male students in the millions. The number of female students enrolled in high school in the United States can be approximated by the function $F(x) = -0.006x^3 + 0.029x^2 + 0.165x + 7.67$ where x is the number of years since 2000 and $F(x)$ is the number of female students in millions. Estimate the total number of students enrolled in high school in the United States in 2007.

Multiplying Polynomials

8) If $f(x) = 2x + 1$ and $g(x) = x - 6$, find $f(x) \cdot g(x)$.

9) If $h(x) = x^2 - 5$ and $g(x) = x - 1$, find $h(x) \cdot g(x)$.

10) Multiply: $-2y^2 + 3y - 6$ *and* $y - 2$

11) $-(2x - 3y)(x^2 + 3y - 2)$

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

13) $-(x - 5)(x + 2)(3x - 1)$

14) What is the degree of the function, $f(x) = (x^2 + 4x - 3)(3x^5 + 6x^3)$?

15) Write the area of a triangle if its height is $2x - 3$ and its base is $5x^2 + 1$.

16) You want to build a raised rectangular garden bed with a certain height h. You want the width to be the height plus 10 feet, and the length to be 5 times the height. Write a polynomial to describe the volume of the garden bed, in feet.

6.2 Notes: Factoring Polynomials

In boxes 1 – 4, Factor:

1) Greatest Common Factor (GCF) $3x + 6$	2) Difference of Perfect Squares $x^2 - 9$	3) Trinomials $x^2 - x - 2$
4) Trinomials with coefficient $5x^2 - 7x - 6$	5) Grouping $x^3 + 6x^2 - 3x - 18$	6) Sum/Difference of Cubes $x^3 + 27$

Sum of two cubes

$a^3 + b^3 = (a + b)(a^2 – ab + b^2)$

Difference of two cubes

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Look at these two formulas and describe the similarities between them.

What are the differences?

Factor the polynomials completely: ****Remember to find the GCF first*****

1) $x^3 + 64$

2) $x^3 - 8$

3) $27x^3 - 125$

4) $-2d^5 - 250d^2$

5) $16b^6 - 686b^3$

For some polynomials, you can ___________ _____ ___________ pairs of terms that have a common monomial factor.

$$ra + rb + sa + sb = r(a + b) + s(a + b)$$
$$= (r+s)(a+b)$$

or use the box method

Factor the polynomials completely:

6) $x^3 - 3x^2 - 16x + 48$

7) $8t^2 + 28ts - 6ts - 21s^2$

8) $2x^3 - 6x^2 + x - 3$

*Go back to the chart and complete the examples in boxes 5 and 6.

6.3 Notes: Dividing Polynomials

Long Division

Divide using long division:

$473 \div 12$

What steps did you do?

Divide $f(x) = x^3 + 3x^2 - 7 \; by \; x^2 - x - 2$

1) Divide $f(x) = 3x^4 - 5x^3 + 4x - 6$ by $x^2 - 3x + 5$

2) $(2x^3 + 10x^2 + 6x - 18) \div (2x + 6)$

Write about it: Imagine that you had to get in front of the class and explain how to do long division with polynomials. Write a paragraph describing what you would say to the class to help them understand the process.

Synthetic Division

A shorthand method for dividing a polynomial by $x - a$ is called synthetic division. It is similar to long division, but you use only the coefficients.

3) Divide $(2x^3 + x^2 - 8x + 5)$ by $(x + 3)$

4) Divide $(4x^3 - 3x + 7)$ by $(x - 1)$

Factor Theorem: a polynomial $f(x)$ has a factor $x - a$ if and only if $f(a)=0$
(REMAINDER = 0)

5) Factor $f(x) = 3x^3 - 4x^2 - 28x - 16$ completely given that $x + 2$ is a factor.

**Because you know x+2 is a factor, you know that f(-2) = 0 or that x = -2 is a root. Use synthetic division to find the other factors.*

6) Factor the polynomial completely given that f(x) = $x^3 - 6x^2 + 5x + 12$ and that $x - 4$ is a factor.

7) Find the other zeros of f given that $f(2) = 0$ and $f(x) = x^3 - x^2 - 22x + 40$

8) Find the other solutions of f given that $x = -7$ is a root and $f(x) = x^3 + 8x^2 + 5x - 14$

6.4 Notes: Rational Root Theorem

The Fundamental Theorem of Algebra: Any polynomial of degree **n** has at most **n** roots, both real and complex.

1) How many x-intercepts does the following function have? $f(x) = 7x^5 - 4x^2 + 1$

2) With a partner try to solve (find the roots of) the polynomial, $x^3 + 7x^2 + 15x + 9 = 0$.

Can it be factored? Any other ways to solve it?

If we know <u>possible roots</u> we can use synthetic division to tell if they are <u>actual roots</u>! So how do we find a possible root?

The Rational Zeros Theorem: If $f(x)$ is a polynomial with integer coefficients and if $\frac{p}{q}$ is a zero of $f(x)$, then p is a factor of the constant term of $f(x)$ and q is a factor of the leading coefficient of $f(x)$.

3) Make a list of all possible rational zeros of $f(x)$ given below.

$f(x) = 2x^4 + x^3 - 19x^2 - 9x + 9$

Steps for finding possible roots:
1. Write down all the factors of the constant term (p)
2. Write down all the factors of the leading coefficient (q)
3. Write down all the possible value of $\frac{p}{q}$. Remember to include both positive and negative factors.
4. Remove any duplicate values.

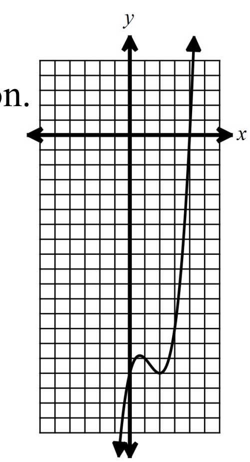
4) Make a list of all possible roots for the function, $f(x) = x^3 + x^2 - 8x - 12$.

Now use synthetic division to see which possible roots are actual solutions to *f(x)*. If it is a solution the remainder needs to be equal to _________.

5) Which of the following are not possible solutions to the function below. Choose all that apply! $f(x) = 2x^4 + 5x^3 - 5x^2 - 5x + 3$

A. 2 B. $-\frac{3}{2}$ C. 1 D. $\frac{1}{2}$ E. $-\frac{2}{3}$ F. 3 G. $\frac{1}{3}$

6) The equation $x^3 - 4x^2 + 4x - 16 = 0$ is graphed to the right.
Use the graph to help solve the equation and find all the roots of the function.



7) a. Find all possible roots of the function, $g(x) = 2x^4 - 3x^3 + 7x^2 + 12x$.

b. Use the possible roots and synthetic division to find the solutions.

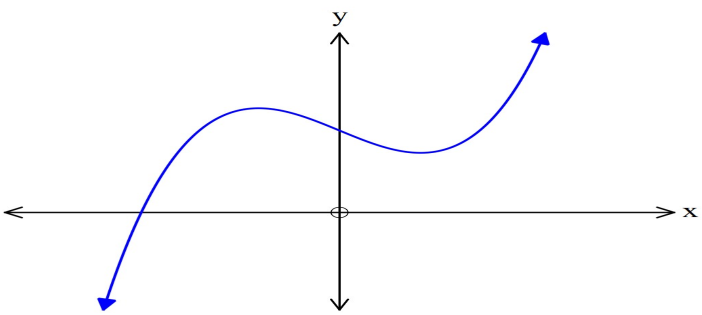
6.5 Notes: Graphing Polynomials day 1

End Behavior:

The end behavior of a function describes what happens to the range as the domain approaches _______________ and ___________________.

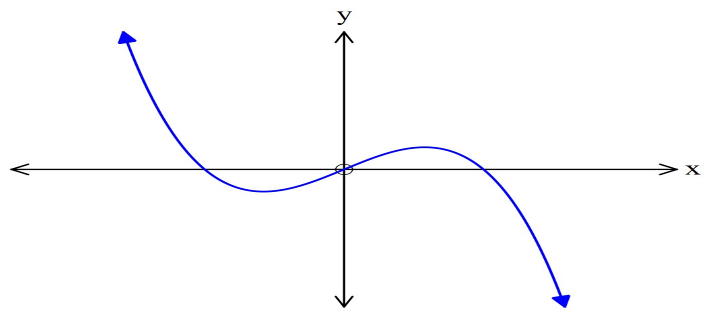
Example 1:

$as\ x \to -\infty, y \to$ $as\ x \to \infty, y \to$



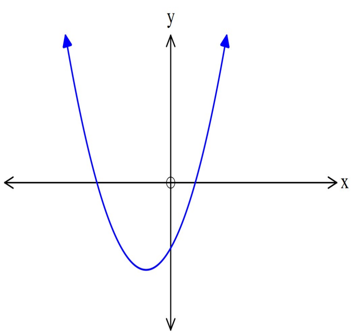
Example 2:

$as\ x \to -\infty, y \to$ $as\ x \to \infty, y \to$

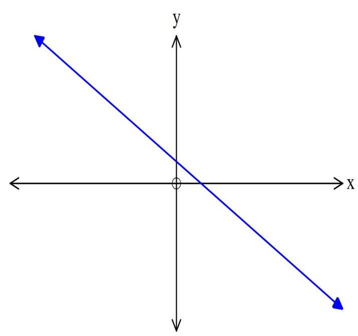


For #3-5, describe the end behavior:

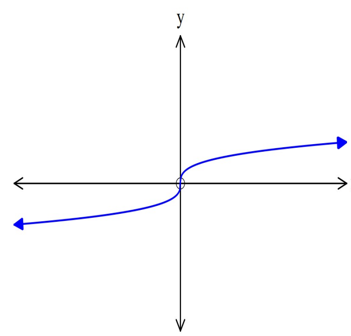
Example 3:



Example 4:



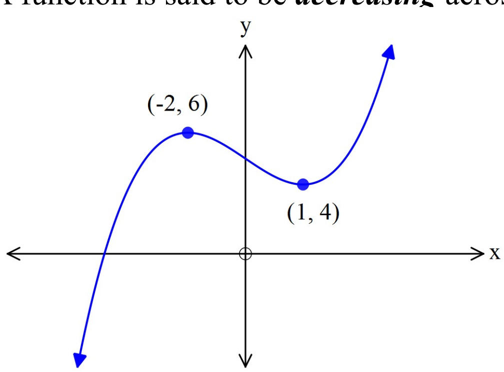
Example 5:



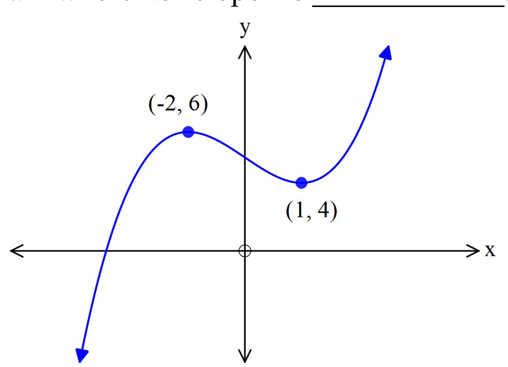
Increasing and Decreasing

A function is said to be ***increasing*** across a certain domain where its "slope" is _____________.

A function is said to be ***decreasing*** across a certain domain where its "slope" is _____________.

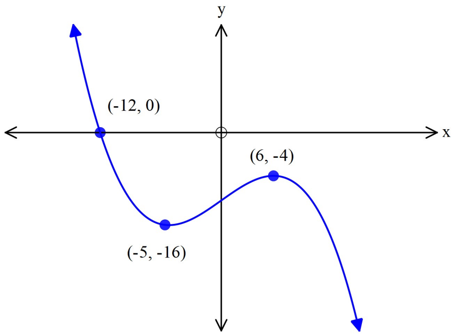


Highlight where the function is increasing.
Write in interval notation:



Highlight where it's decreasing.
Write in interval notation:

6)



Increasing:

Decreasing:

Degree:

End behavior:

Max:

Relative Max:

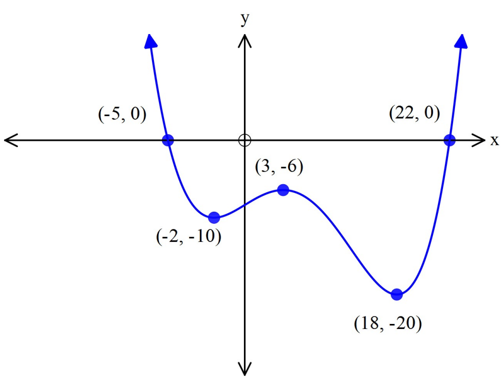
Min:

Relative Min:

Positive:

Negative:

7)



Increasing:

Decreasing:

Degree:

End behavior:

Max:

Relative Max:

Min:

Relative Min:

Positive:

Negative: