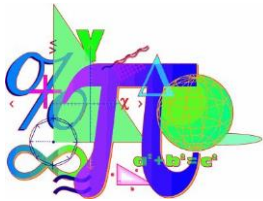


Name \_\_\_\_\_

Date \_\_\_\_\_

## Watertown Public Schools Pre-calculus Honors Summer Packet



Attn: In coming Pre-calculus Students & Parents/Guardians

This packet contains topics that you are expected to know prior to entering Pre-calculus. You have learned these skills over the past few years. These examples focus on both mathematical skills and problem solving. Pre-Calculus is a critical course and one of the best predictors of college success. Mastery of the problem solving skills outlined in this packet is a critical baseline for your success. This packet should be completed independently and **turned in with completed work on the first day of school for a grade.** Upon your completion, your parent/guardian needs to sign the packet.

Make sure you understand how to do the problems. If you are unsure of how to do these problems, utilize some of the resources below.

A TI-83 or TI-84 graphing calculator is **HIGHLY recommended** for Pre-calculus and future math courses both at Watertown High school and in college.

We look forward to working with you in Pre-calculus and remind you that success is built by the efforts you make every day.

Below are helpful links to help you remember some topics.

### Resources

- **Khan Academy** Take control of your learning by working on the skills you choose at your own pace. ... Math, science, computer programming, history, art, economics, and more.
- **Algebasics** has video tutorials explaining the basics of algebra, equations, ratio and proportion, absolute value, polynomials, factoring, linear equations, radicals, applications, and much more.
- **Algebra-Class.com** offers help with solving equations, graphing equations, writing equations, inequalities, functions, exponents and monomials, polynomials, and the quadratic equation. It also has a list of resources.
- **Algebra.help** contains lessons on topics that include equations, simplifying, factoring, distribution, and trinomials, as well as equation calculators and worksheets. This site also has an extensive list of math resources and study tips.
- **Algebra Help** covers topics such as fractions, percents, decimals, algebraic expressions, addition, multiplication, and word problems. Each section includes explanations and examples.
- **College-Cram.com** allows students to choose the algebra subject they are struggling with from a drop down menu, select the appropriate chapter, and pick your resources. The pages will feature formula solvers, bottomless worksheets, flashcards, quizzes, interactive overviews, and brief lessons and study sheets.
- **Interactive Mathematics** has a large section on algebra, including information on factoring and fractions, the quadratic equation, exponents and radicals, systems of equations, matrices and determinants, and inequalities.
- **Math Expression** has videos, worksheets, and lessons to help you develop your algebra skills. Math topics include algebra, exponents, symmetry, fractions, measurements, angles, and more. The site also includes a list of useful resources.
- **Purplemath** contains lessons with explanations on everything from absolute value and negative numbers to intercepts, variables, and factoring. In addition, this site includes a forum that allows students to ask questions and receive answers, as well as a list of homework tips and guidelines.

***The packet is expected to be completed for the first day of class.***

**Must show your work in the packet.**

***This summer packet will be a review of the Polynomial unit that was covered in Algebra II. The topics listed below will be needed when we start the Rational Function Unit. There will be an assessment covering Polynomials within the second week of class.***

- Definition of a polynomial and key terms (standard form, degree, leading coefficient, constant, max/mins, zeros)
- End behavior
- Factoring (GCF, sum and difference of cubes, grouping, and quadratic form)
- Multiplicity of zeros
- Given the zeros write a polynomial equation
- Graphing polynomials
- Long division and synthetic division
- Remainder theorem and factor theorem
- Operations with complex numbers
- Fundamental Theorem of Algebra
- Rational Zero Test

1.) Which of the following function are not polynomials? Explain.

a.)  $f(x) = x^4 - \pi x^2 + 1$

b.)  $f(x) = 2x^3 + 4x^{-2} - x$

c.)  $f(x) = 3x + 2^x - 6x^5$

**Analyze the following Polynomials**

2.)  $f(x) = x^4 + 8x - 2x^3 - 4 - 3x^2$

Standard Form:

Leading Coefficient:

Degree:

End Behavior:

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

Standard Form:

Leading Coefficient:

Degree:

End Behavior:

4.) Find all real zeros by factoring.

Sum and Difference of Cubes

$f(x) = x^3 + 216$

$g(x) = 64x^3 + 27$

$h(x) = 27x^3 + 512$

$p(x) = x^3 - 343$

$q(x) = 8x^3 - 1$

$s(x) = x^3 - 1000$

## **Quadratics**

$$f(x) = x^2 - 7x - 18$$

$$g(x) = 7x^2 - 31x - 20$$

$$h(x) = x^2 - 4x - 12$$

$$p(x) = 5x^2 - x - 18$$

$$q(x) = x^2 - 9x + 8$$

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

## **Factor by Grouping**

$$f(x) = x^3 - 3x^2 + 5x - 15$$

$$g(x) = x^3 - 5x^2 - 9x + 45$$

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

$$p(x) = 5x^3 + 5x^2 + x + 1$$

$$q(x) = 3x^3 - 12x^2 + 2x - 8$$

$$s(x) = x^3 + 2x^2 + 7x + 14$$

*Quadratic Form*

$$f(x) = 16x^4 - 81$$

$$g(x) = -x^4 - 10x^2 - 21$$

$$h(x) = x^4 + x^2 - 6$$

$$p(x) = x^4 - 7x^2 + 1$$

$$q(x) = 2x^4 - 200x^2$$

$$s(x) = x^6 - 9$$

**Analyze the Polynomial functions**

5.)  $f(x) = 4x^3 - 20x^2 + 25x$

Degree:

Leading Coefficient:

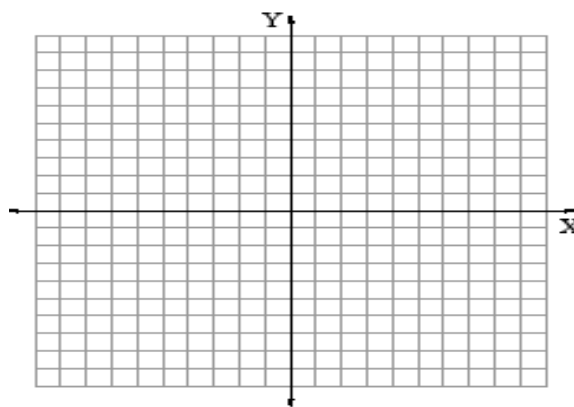
# of Possible zeros:

# of Possible Max/min:

End Behavior:

y-intercept:

List the factors:



List the zeros:

6.)  $f(x) = x^3 + 3x^2 - 9x - 27$

Degree:

Leading Coefficient:

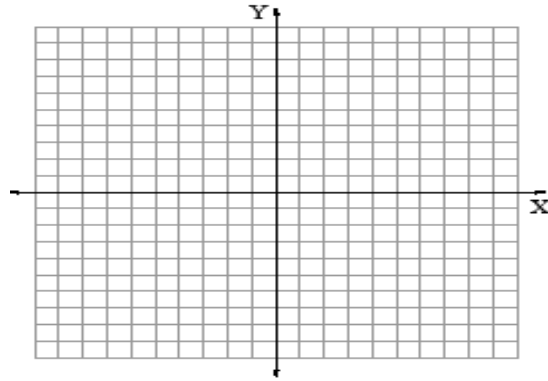
# of Possible zeros:

# of Possible Max/min:

End Behavior:

y-intercept:

List the factors:



List the zeros:

7.)  $f(x) = 9x^4 + 5x^2 - 4$

Degree:

Leading Coefficient:

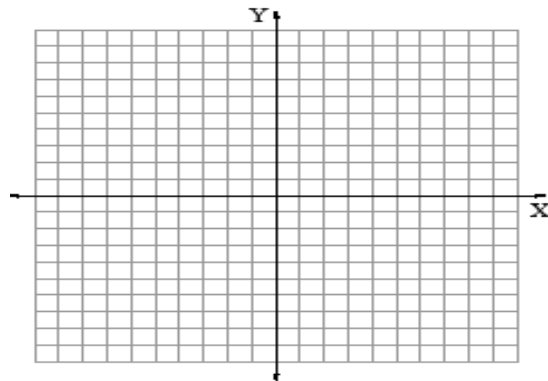
# of Possible zeros:

# of Possible Max/min:

End Behavior:

y-intercept:

List the factors:



List the zeros:

8.) a. Write a polynomial function in standard form of degree 3 given the following zeros 0,  $\frac{1}{3}$ , -2.

b. Find a fourth degree polynomial given the following zeros?

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

9.) Long Division: use long division to divide.

Divide  $2x^2 + 10x + 12$  by  $x + 3$

Divide  $4x^3 - 7x^2 - 11x + 5$  by  $4x + 5$

$$(6x^3 + 10x^2 + x + 8) \div (2x^2 + 1)$$

$$(x^3 - 9) \div (x^2 + 1)$$

**10.) Synthetic Division: use to divide.**

$$(3x^3 - 17x^2 + 15x - 25) \div (x - 5)$$

$$(9x^3 - 18x^2 - 16x + 32) \div (x - 2)$$

$$(x^3 + 512) \div (x + 8)$$

**Operation with complex Numbers**

11.)  $(2 - 3i)(4 + i)$

12.)  $\frac{5 - i}{3 + i}$

13.)  $\frac{1}{6 - i} + \frac{3}{1 + i}$



14.) Find the zeros of the polynomial function. Show work for each of the following steps/methods.

$$f(x) = 2x^6 - 7x^5 + 4x^4 - 28x^3 - 16x^2$$

a.) Degree: \_\_\_\_\_

b.) L.C. \_\_\_\_\_

c.) Factor out a common term: \_\_\_\_\_

d.) Possible number of zeros: \_\_\_\_\_

e.) Possible number of max/min: \_\_\_\_\_

f.) List the possible candidates for real zeros. (Rational Zero Test)

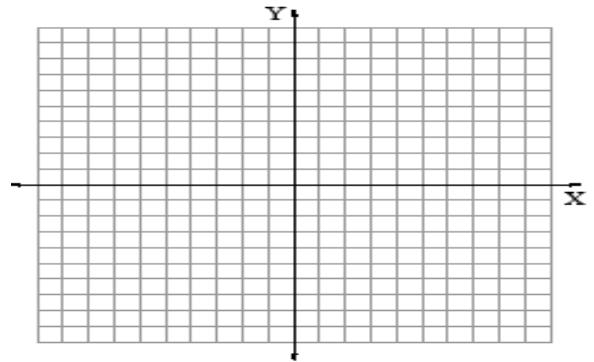
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h.) Find all zeros (real/complex) by different methods? (Ex. Calculator, Synthetic division, factoring, etc.)

Zeros: \_\_\_\_\_ Factors: \_\_\_\_\_

i.) Sketch a graph using the real zeros

Graph:



15.) Find the zeros of the polynomial function. Show work for each of the following steps/methods.

$$f(x) = x^4 + x^3 - 2x^2 + 4x - 24$$

a.) Degree: \_\_\_\_\_

b.) L.C. \_\_\_\_\_

c.) Factor out a common term: \_\_\_\_\_

d.) Possible number of zeros: \_\_\_\_\_

e.) Possible number of max/min: \_\_\_\_\_

f.) List the possible candidates for real zeros. (Rational Zero Test)

\_\_\_\_\_

h.) Find all zeros (real/complex) by different methods? (Ex. Calculator, Synthetic division, factoring, etc.)

Zeros: \_\_\_\_\_ Factors: \_\_\_\_\_

i.) Sketch a graph using the real zeros

Graph:

