AP Precalculus Summer Assignment

Welcome to AP Precalculus! This is an advanced and rigorous course that requires high levels of critical thinking. The expectation for this course is that all Algebra II skills must be mastered prior to the beginning of this class. Examples of mastered skills includes, but are not limited to:

- Simplifying complex fractions
- Simplifying rational expressions
- **Factoring**
- Solving and manipulating linear, quadratic, exponential, logarithmic, and rational equations
- Understanding the intercepts, domain/range, and min/max of various graphs
- Vertical and Horizontal transformations from parent functions

The purpose of this assignment is to review, practice, and deepen your understanding and fluency of the mathematical concepts required to succeed in this course. The goal of this assignment is not to simply finish the packet, but for you to thoroughly master all components. If you struggle with any question, research how to find the answer either from a textbook, a parent, a friend, or an online resource!

You must show all work to receive full credit, and all work must be completed neatly. Only use a calculator in the appropriate sections. If you see a calculator crossed out in the corner, you are expected to complete that page without use of a calculator. Circle or box your final answers. Not every answer will be an integer. Round any answers to three decimal places.

This assignment is due the first week of classes and will be counted as a quiz grade.

I look forward to meeting each of you and working with you in our AP Precalculus class! 😀

- Mr. Berry

Name: ______________________________

Answer the following questions using the table and equation below. A graphing calculator is **required** to answer the questions. Round all answers to 3 decimal places.

1. The function *f* is increasing and is defined for all real numbers. The table gives the values for $f(x)$ at selected values of x.

x	–1	0	1	2	3	4
$f(x)$	0.25	1	4	16	64	256

The function g is given by $g(x) = -0.21x^3 - 1.28x^2 + 1$

A.

i. The function h is defined by $h(x) = (g \circ f)(x) = g(f(x))$. Find the value of $h(1)$ as a decimal approximation, or indicate that it is not defined. Show the work that leads to your answer.

ii. Find the value of $f^{-1}(4)$, or indicate that it is not defined.

B.

i. Find all values of x, as decimal approximations, for which $g(x) = 0$, or indicate that there are no such values.

ii. Describe the end behavior of g as x increases without bound (as x approaches infinity, what is y doing?).

C.

i. Based on the table, which of the following function types best models function f: linear, quadratic, exponential, or logarithmic? Explain your reasoning.

ii. Is the inverse of f a function? Explain your reasoning using the definition of a function.

2. A toy rocket is launched from a platform 108 feet in the air (at time $t = 0$). The table gives the toy rocket's height, in feet, for selected times t seconds after the launch. At $t = 0$, the toy rocket's height was 108 feet. At $t = 1$, the toy rocket's height was 144 feet. At $t = 2$, the toy rocket's height was 100 feet.

Time (in seconds)	0	1	2
Height (in feet)	108	144	100

The height, in feet, for the toy rocket since its launch can be modeled by the function H given by $H(t) = at^2 + bt + c$, where $H(t)$ is the height of the toy rocket, since its launch, and t is the number of seconds after the toy rocket launched.

A. Given that $H(t)$ is a quadratic function, find the values for a, b, and c. (Hint: try finding the curve of best fit for the points)

B. What is an appropriate domain for the quadratic function $H(t)$? Explain your answer.

Inverse Functions:

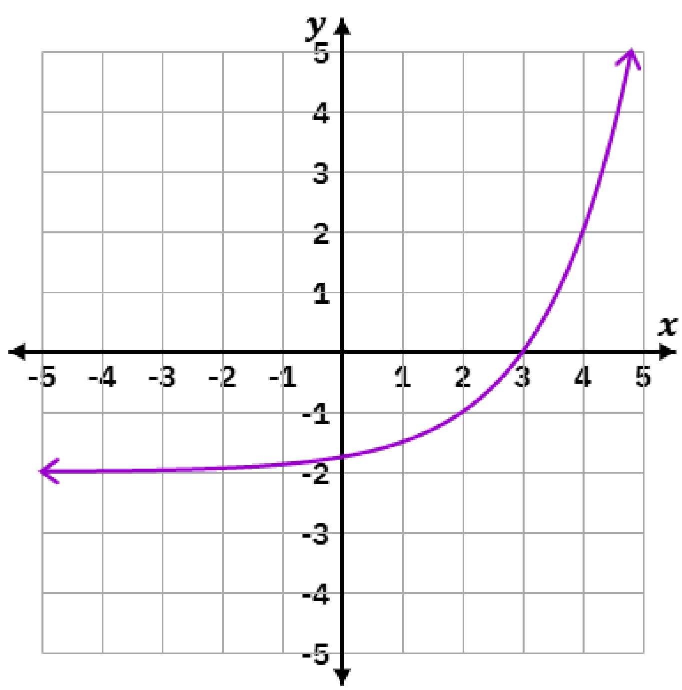
Find the inverse for the following functions:

1. $g(x) = \sqrt{x + 8}$

2. $f(x) = 2(x - 5)^3 - 10$

3. $m(x) = \frac{(x^5 - 8)^{\frac{1}{7}}}{7}$

4. Graph the inverse:



Polynomial Functions:

Factor each expression/equation fully:

1. $x^2 - 3x - 4$

2. $x^2 + 4x - 21$

3. $x^2 - 10x + 25$

4. $x^2 - 49$

5. $3x^2 + 12x - 36$

6. $3x^2 - 8x + 4$

7. $5x^2 + 14x + 9$

8. $4x^2 + 31x + 21$

9. $3x^2 + 16x + 9 = 4$

10. $5x^2 + 13x + 21 = 3x^2$

Use the equation provided below to answer the following questions.

$$0 = x^3 + x^2 + 4x + 4$$

What is the degree of the equation?

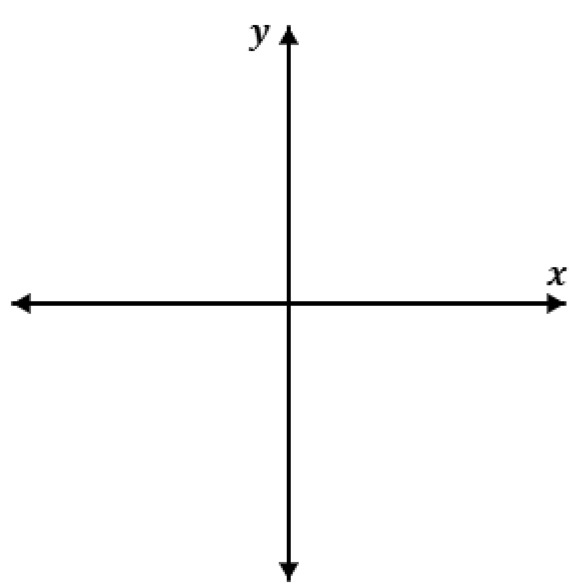
What type of polynomial is shown?

Is the polynomial equation written in standard form? If not, write it in standard form.

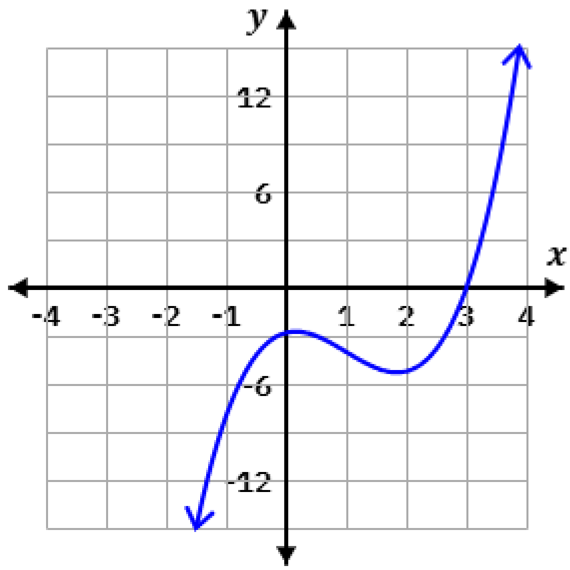
Verify whether the factored form of the equation is $0 = \left(x^2 + 4\right)(x + 1)$.

Use the factored form of the equation to identify its corresponding roots (real and imaginary).

Draw a rough sketch of the polynomial above labeling all intercepts.



Use the graphed form of a polynomial equation shown below to answer the following questions.



What is the degree of the polynomial equation?

What is the type of polynomial equation?

How many real solutions does the graph have?

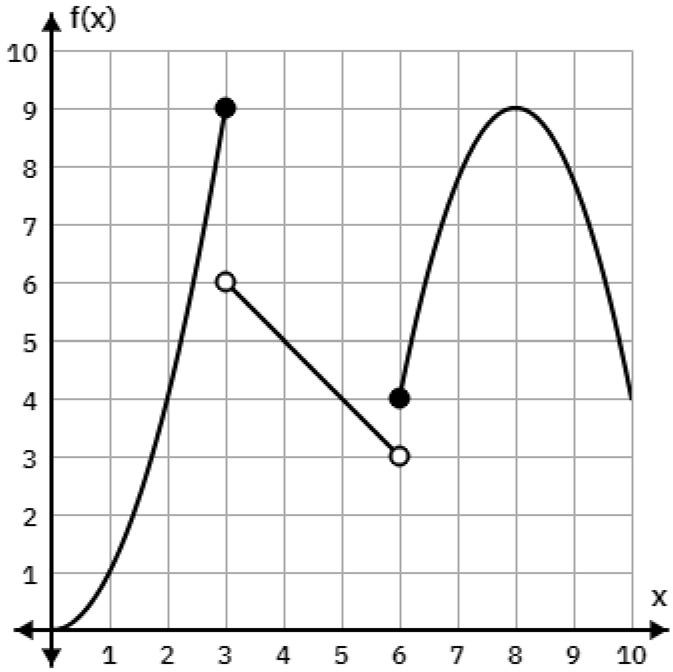
Identify all real solutions.

Use any real solutions that exist to determine a factor of the equation. Your answer should be in the form $(x + a)$ where a is an integer.

Determine the number of imaginary solutions.

<u>Piecewise-Defined Functions:</u>

Refer to the piecewise graph for the following questions:



Solve for $f(2)$

Solve for $f(6)$

Solve for $f(8)$

Solve for $f(x) = 1$

Solve for $f(x) = 9$

Solve for $f(x) = 4$

Determine all intervals on $0 \leq x \leq 10$ where the function is increasing.

Determine all intervals on $0 \leq x \leq 10$ where the function is decreasing.

<u>Use the graph below for the following questions:</u>

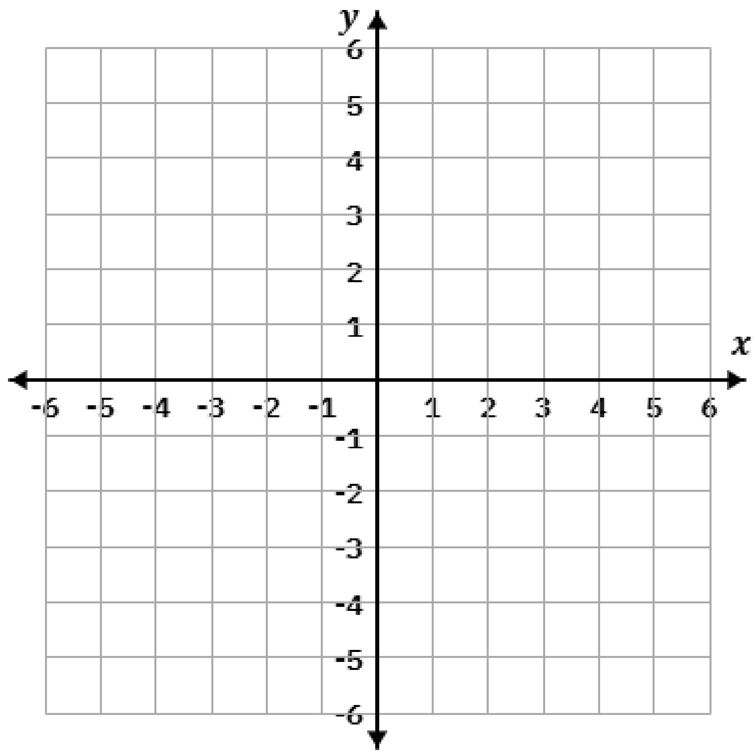
Let $g(x) = (x + 1)^2 - 4$ and $h(x) = \frac{(x+2)}{(x-3)}$

Graph the equations $g(x)$ and $h(x)$ with at least two integer coordinate points each.

Describe the transformation of $g(x)$ from its parent function of $f(x) = x^2$.

Describe the global extrema of $g(x)$.

Rewrite $g(x)$ in standard form.



Find the y-coordinate(s) of the y-intercept(s) of $h(x)$.

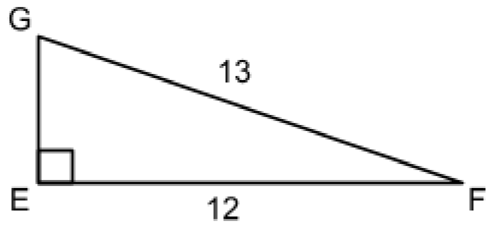
Find the x-coordinate(s) of the x-intercept(s) of $h(x)$.

Find the equation of all **<u>vertical</u>** asymptotes of $h(x)$.

Find the equation of all **<u>horizontal</u>** asymptotes of $h(x)$.

Trigonometry:

Use ΔEFG for the following trigonometry questions:



Find the exact values for the following in **simplest** form.

$\sin G$ = _____ $\cos G$ = _____ $\tan G$ = _____

$\csc F$ = _____ $\sec F$ = _____ $\cot F$ = _____

Exponential Expressions:

Express the following fractions in simplest form using only positive exponents.

$\frac{3(s^3)^4}{12s^8}$ $\frac{4b^{-8}}{(-3b^5)^5}$ $\frac{4t^9s}{(2t^4s^{-3})^{-3}}$