

# 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. In addition, **calculators are NOT permitted** on this packet. Please circle or box your final answers. Not every answer will be an integer.

This assignment is due the first week of classes and will be counted as a quiz grade. You will also have a non-calculator diagnostic test the second week of school to assess where you are currently at.

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

- Mr. Berry





Name: \_\_\_\_\_

**Linear Expressions, Equations, and Inequalities:**

Solve for  $x$  in the following equations and write each answer in simplest form:

**1.**  $-(x + 2) + 5x = 5(-3x - 6) + 5x$

**2.**  $3(-7x - 3) + 4x = -(x - 3)$

**3.**  $-5 - 3(-10x + 3) = 8 - 2(-3x - 1)$

**4.**  $-9 - (x + 1) = -2 - (3x - 5)$

**5.**  $7(-x + 2) - 6x = 5(-x - 1) - 3x$



Solve for the variable in the following inequalities and graph each answer on a number line.

**1.**  $5x + 8 \leq 9x - 6$



**2.**  $-7h - 5(5h - 4) > -5h - 8 + h$



**3.**  $6m - 3(4m + 1) < 10m - 8 - 7m$



**4.**  $|g + 2| - 1 > 4$



**5.**  $x^2 - 2x + 1 \leq 4$





**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 quadratic formula to solve for all real solutions in simplest form:

1.  $k^2 + 10k + 18 = 0$

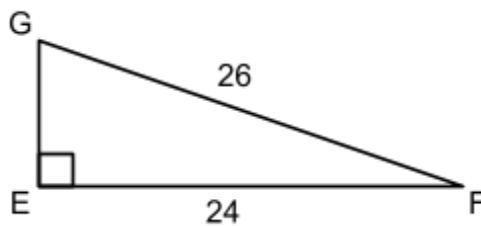
2.  $m^2 - 3m - 3 = m$

3.  $3r^2 + 12r + 7 = -r^2$

4.  $4a^2 - 14a + 13 = 2$

**Trigonometry:**

Use  $\triangle EFG$  for the following trigonometry questions:



Find the exact values for the following in simplest form.

$\sin G = \underline{\hspace{2cm}}$        $\cos G = \underline{\hspace{2cm}}$        $\tan G = \underline{\hspace{2cm}}$

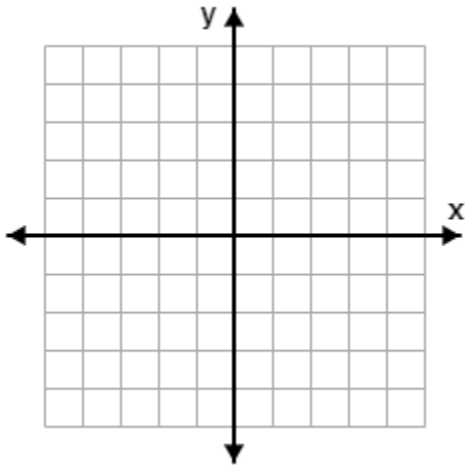
$\csc F = \underline{\hspace{2cm}}$        $\sec F = \underline{\hspace{2cm}}$        $\cot F = \underline{\hspace{2cm}}$



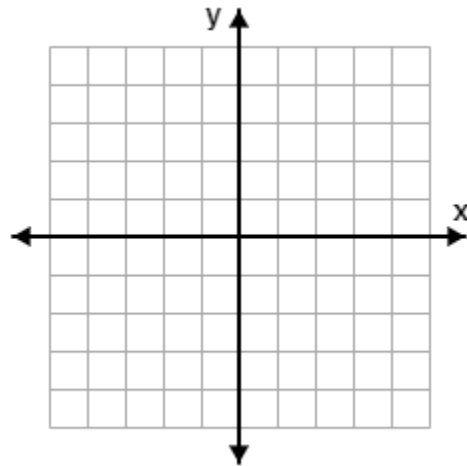
### **Systems of Equations:**

Graph the system of equations and show and label the solutions points:

$$\begin{cases} y = 2x + 1 \\ y = -x - 2 \end{cases}$$



$$\begin{cases} y = -x^2 + 2 \\ 2x - y = -2 \end{cases}$$



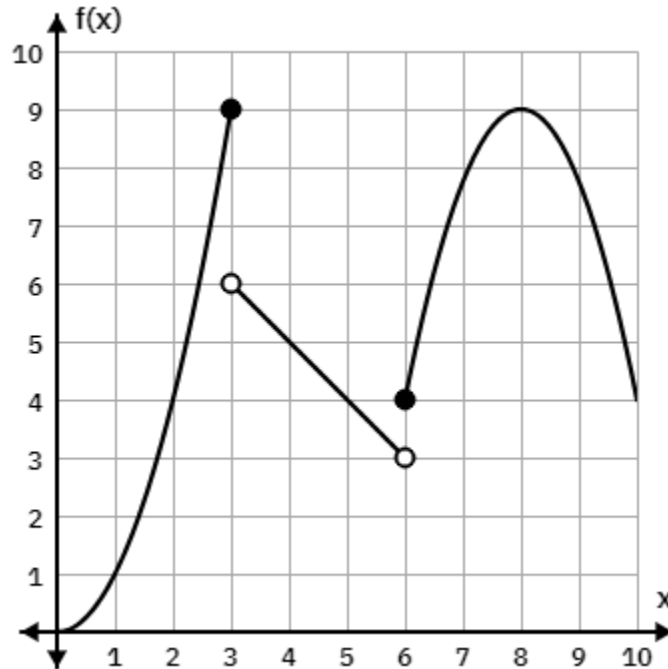
Solve the following system of equations for all three variables.

$$\begin{cases} 4x + y + z = -10 \\ 5x - 3y - z = -7 \\ 6x + y - z = 8 \end{cases}$$



### Piecewise-defined Functions:

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  $f(x) = 4$

### Exponential Functions and Radicals:

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

$$\frac{3(s^3)^4}{12s^8}$$

$$\frac{4b^{-8}}{(-3b^5)^5}$$

$$\frac{4t^9s}{(2t^4s^{-3})^{-3}}$$





Assuming  $x$  and  $y$  are both positive, write the following expression in simplest radical form.

$$xy\sqrt{27x^5y^6}$$

$$2y^3\sqrt{50x^7y^5}$$

$$xy^2\sqrt[3]{8x^{10}y^7}$$

Rewrite the following expressions using a single fractional exponent.

$$\sqrt[3]{3} \cdot \sqrt[5]{3^2}$$

$$\sqrt[5]{7} \cdot \sqrt[4]{7^3}$$

### **Complex Numbers:**

Simplify the expressions to  $a + bi$  form:

**1.**  $(11 + 2i) + (7 - 5i)$

**2.**  $(8 + 2i) + (3 + 9i)$

**3.**  $(-5 - 8i) - (7 - 4i)$

**4.**  $(6 + 9i) - (3 - i)$

**5.**  $(5 - 2i)(9 + 10i)$

**6.**  $(-7 + 2i)^2$

What are the roots of the equation  $x^2 - 12x + 37 = 0$  in simplest  $a + bi$  form?

### **Various Representations of Functions:**

Find  $(f \circ g)(x)$  when  $f(x) = 2x + 3$  and  $g(x) = 3x^2 + 2$

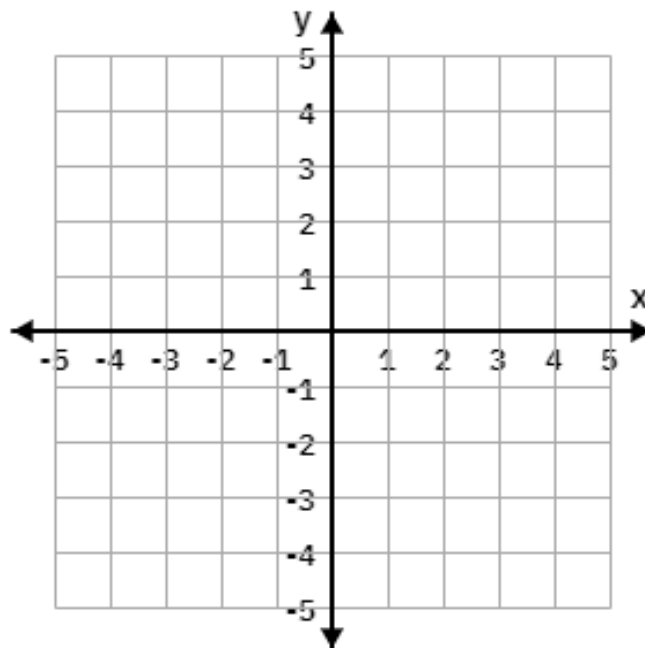
Find  $(g \circ f)(x)$  when  $f(x) = x^2 - 4x + 1$  and  $g(x) = 5x - 2$

**Use the graph below for the questions:**

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

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

**b.** Describe the transformation of  $g(x)$  from its parent function of  $f(x) = \sqrt{x}$ .



**c.** What ordered pair is the solution of the equations  $g(x)$  and  $h(x)$ ?

**d.** Write the equation of the horizontal asymptote found in  $h(x)$ .

**e.** State the domain of  $g(x)$ .

**f.** State the range of  $h(x)$ .