**Required Math Summer Review Homework**
**Honors Precalculus**

**Please read through the list below then complete the problems that follow the list.**
**These problems are <u>due</u> on the first day of class.**

Name: _____

**At this point in your mathematics career, you should be fully versed in the following:**

- **Linear functions and their graphs**
- **Average rate of change (slope), including interpreting slope and finding slopes of parallel and perpendicular lines.**
- **Absolute value functions including solving absolute value inequalities**
- **Quadratic functions: finding zeros, finding vertex, finding equations, different forms of the equation (standard form, vertex form, factored form), and applying them in word problems.**
- $i = \sqrt{-1}$
- **Solving systems of equations – linear systems and those with linear and quadratic equations**
- **Solving inequalities**
- **Finding domain and range of functions**
- **Properties of exponents**
- **Simplifying complex algebraic expressions, including simplifying radicals**
- **Factoring (finding common factors, factoring binomials, factoring by grouping, etc)**
- **Transformations of functions (left, right, up, down, reflections, stretches/compressions)**
- **Special right triangle relationships (30-60 right triangle and 45-45 right triangles)**
- **Right triangle trigonometry (SOHCAHTOA)**

**Additionally, you should have some working knowledge of:**

- **Power functions and polynomials, including end behavior**
- **Rational functions and their graphs, including vertical and horizontal asymptotes**
- **Piecewise functions**
- **Inverse functions**
- **Exponential functions, including base *e***
- **Properties of logarithms**
- **Solving exponential functions using logarithms**
- **Radian measure of an angle**
- **How to use your graphing calculator to graph a function, to find zeros, to find maximum and minimums and to find points of intersection.**

**Here are some problems for you to use to practice many of the aforementioned concepts and skills. They are due on the first day of class. You will be able to seek extra help if you need help with any of the problems during the first week of school.**

**Part I:  No Calculators and Show All Work**

1.  Find the average rate of change between the points (-3, 7) and (5, -3).

2.  Your answer to #1 is either positive or negative.  What does the sign of the average rate of change tell you about a line that passes through those two points?  Is this line increasing, decreasing, constant?  Explain.

3.  Find the equation of the line passing through the points in #1.  Write your equation in slope-intercept form AND in point-slope form.

4.  Find the equation of the line that is perpendicular to the line in #1 and passes through the point (4, 1).

5.  Solve for $P$ in terms of $Q$:  $6Q - 7P = P - Q + 11$

6.  Shade the solution to the following inequality on the axes below:

$$3x - 2y > 10$$
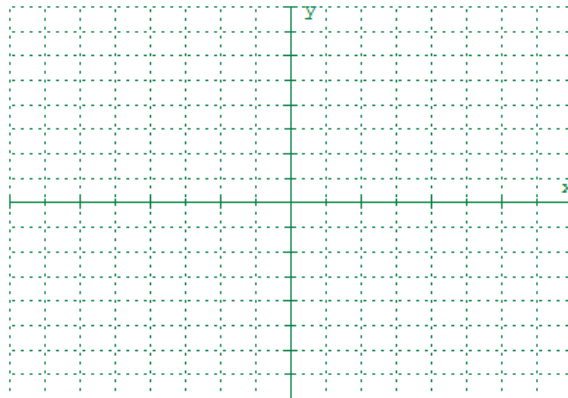
7.  Solve the following inequality $x^2 \leq 4x + 12$ algebraically. Then graph the functions $y_1 = x^2$ and $y_2 = 4x + 12$ on the axes provided to show your solution graphically.
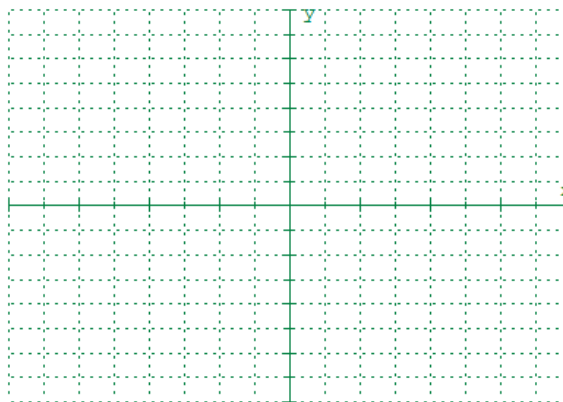
8.  Factor the following:

a.  $x^3 - 3x^2 - 4x + 12$

b.  $\pi r^2 + \pi r l$

9. Find the domain and range of the following functions:

   a. $f(x) = |x - 8| + 1$

   b. $g(x) = \dfrac{3x - 2}{x + 5}$

   c. $h(x) = \sqrt{7 - 5x}$

10. Refer to the functions in #9 to answer the following questions:

    a. Describe how $f(x)$ has been transformed from the basic function $y = |x|$

    b. Find the inverse of $h(x)$.

    c. Evaluate $h$(-5).

    d. Simplify $g$(1 - x).

11. Simplify the following: $\dfrac{2x-2}{5x+2} \div \dfrac{x-1}{x}$

12. Solve the following equations:

    a. $(x+3)^2 - 4 = 0$ (try to solve <u>without</u> squaring the binomial first)

    b. $\dfrac{2}{x-1} + \dfrac{3}{x+5} = 8$

    c. $3\sqrt{x-8} = 5$

13. Simplify the following leaving no negative exponents:

    a. $\left(x^{1/3} y^{-5/3}\right)^{-3}$

    b. $\dfrac{12x^2 z^{-3} y}{(2x^3 zy^{-1})^{-2}}$

14. Refer to the following quadratic function: $f(x) = 2x^2 - 12x + 10$.
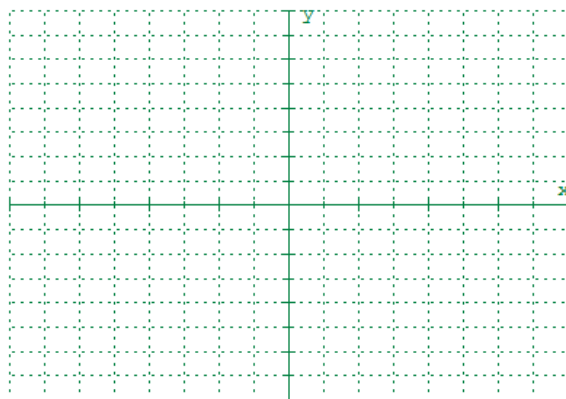
    a. Find the equation for the axis of symmetry and the coordinates of the vertex.

    b. Write the equation for $f(x)$ in vertex form.

    c. Find the *x*- and *y*-intercepts.

    d. Give the domain and range of this function

    e. Sketch the graph on the axes below.  Clearly label your scale.

15. How much 10% solution and how much 45% solution should be mixed together to make 100 gallons of 25% solution?

16. Evaluate the following:

    a. $\log_5\left(\dfrac{1}{25}\right)$

    b. $\log(1000)$

17. Write the following expression as a single logarithm.  In other words, use the properties of logarithms to write the expression as $\log_3(\ \text{some expression})$

    $2\log_3(x-1)-\log_3(10x)$

18. Solve for $x$ exactly – your answers will have logarithms in them.

    a. $3^{2x}=20$

    b. $e^{4x+1}=17$

19. An equilateral triangle has a base length of 12 meters. Find the area of this triangle. Leave your answer in simplified radical form.

**Part II:  With Calculators and SHOW ALL WORK**

20. Find the zeros of the following quadratic functions <u>algebraically</u>. Leave them exact, then round to two decimal places. Note: your answers might be non-real.

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

b. $g(x) = 3x^2 + x + 2$

21. Refer to the following function: $g(x) = -x^3 + 4x^2 + 31x - 70$. Solve the following questions graphically (with your graphing calculator's features.)
   a. Find the zeros (*x*-intercepts) of the graph of this function.

   b. Find the coordinates (*x* and *y*) of any turning points on the graph (local maximum and/or minimum values).

22. The height of an object above the ground that has been launched straight up or down can be modeled by the projectile motion equation $h(t) = -16t^2 + v_0t + h_0$ where $h_0$ is the object's initial height above the ground (in feet) and $v_0$ is its initial velocity in feet per second.
Suppose a projectile is launched straight up from the top of a 3.5 foot stand with an initial velocity of 48 feet per second.

      a.  Find an equation to model the height of this object above the ground after $t$ seconds.

      b.  Approximately how high will this projectile go? Solve algebraically then use your calculator if needed, to calculate your final answer.

      c.  How long until the projectile hits the ground? Again, solve algebraically then use your calculator to approximate your final answer.

23. Draw a picture, write an equation, and solve the following problems: Jose's paint crew knows from experience that its 18 foot ladder is particularly stable when the distance from the ground to the top of the ladder is 5 feet more than the distance from the building to the base of the ladder.

      a.  How far up the building does the ladder reach?

      b.  Using right triangle trigonometry, find the measure of the angle that the ladder makes with the ground.