

### *Pre-calculus Honors Summer Assignment*

The questions in this problem set are considered pre-requisite material for a student entering Precalculus Honors. All of the topics represented here were covered in prior classes (Algebra, for the most part), and are representative of topics essential for success in this course. The questions were selected to reinforce important basic algebraic principles, with the hope that we need not spend too much time reviewing the basics.

Surely, after a year of geometry, a student can forget many of the algebra skills learned previously. While there may be a couple of questions that present a struggle, please feel free to get assistance from a textbook or from an individual that can help, but only after you have attempted the problem on your own to the best of your abilities. Please show all work on the packet, and attach any extra scrap paper to the packet. **You may NOT use a calculator.**

Be prepared to submit this assignment on the second day of class.

1. Find the length of  $\overline{CD}$  and the coordinates of the midpoint of  $\overline{CD}$  where  $C(-2, -1)$ ,  $D(4, 9)$

2. Solve each of the following equations for  $x$ .

a.  $\frac{x+1}{3} - \frac{x-1}{2} = 1$

b.  $\frac{60}{x} - \frac{60}{x-5} = \frac{2}{x}$

c.  $2|2x-7|+11=25$

d.  $x=\sqrt{x+7}+5$

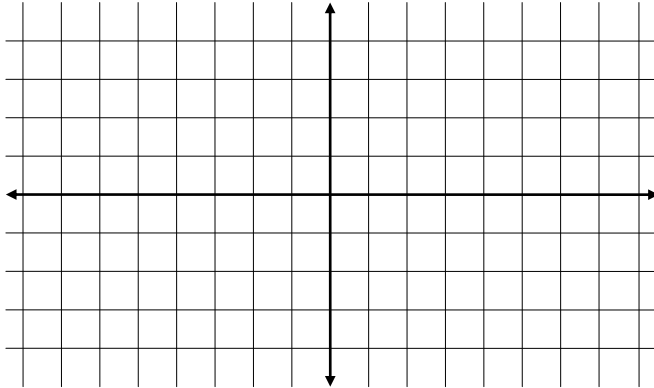
e.  $\log_4(2x+6)=3$

f.  $8=2^{3x-9}$

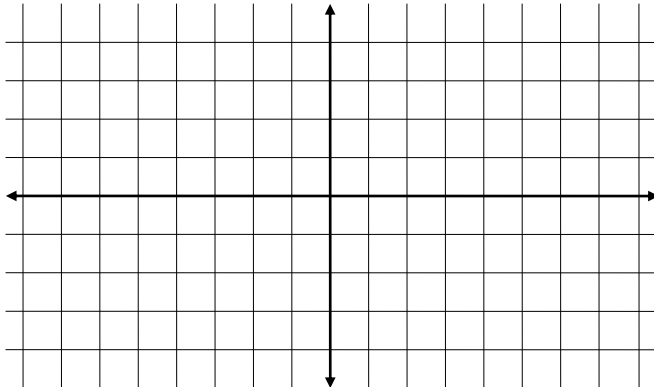
g.  $4x(x-1)=3(x-1)^2$

h.  $(4x+4)^2=-16$

3. Find the equation of the line through the points  $(-1,4)$  and  $(5,8)$ . Graph this line.



4. Find the equation of the line through  $(8,-2)$  perpendicular to the line  $y = 7 - 2x$ . Graph this line.



5. Let  $f(x) = 3x^2 - 2x - 7$ . Find:

a.  $f(-2a)$

b.  $f(x+1)$

6. Solve the given systems of equations using any method.

a. 
$$\begin{cases} x - 3y = 4 \\ 5x + y = -8 \end{cases}$$

b. 
$$\begin{cases} 3s - 5t = -30 \\ 7s + 11t = 32 \end{cases}$$

7. Solve and graph the following inequalities. Express your answer using interval notation.

a. 
$$\frac{15 - 6x}{3} > 6$$

b. 
$$2|3x - 9| \geq 18$$

8. Simplify the following. Express your answer using only positive exponents, where applicable.

a. 
$$(121^{1/2} + 25^{1/2})^{-3/4}$$

b. 
$$\left(\frac{5}{8}x^4 - \frac{1}{4}x^2\right) - \left(-\frac{3}{8}x^4 + \frac{3}{4}x^2\right)$$

c. 
$$\frac{10x^3y}{3xy+9y} \cdot \frac{x^2-9}{4x^2-12x}$$

d. 
$$\frac{a^2-b^2}{ab} \div \frac{a^2-2ab+b^2}{2a^2b^2}$$

e. 
$$\left(\frac{8u^{-1}}{2^2u^2v^0}\right)^{-2} \left(\frac{u^{-5}}{u^{-3}}\right)^3$$

f. 
$$\frac{4m-3}{18m^2} + \frac{3}{4m} - \frac{2m-1}{6m^2}$$

g. 
$$\frac{5+i}{5-i}$$

h. 
$$(8+3i)(2-5i)$$

i.  $\frac{1}{6}(7-2i) + \frac{2}{3}(5-5i)$

j.  $\frac{5-2i}{4+3i}$

k.  $\frac{x^2-x-12}{2x^2-5x-12} \div \frac{x^2+8x+15}{2x^2+13x+15}$

l.  $\frac{6x-23}{2x^2+x-6} + \frac{3x}{2x-3} - \frac{5}{x+2}$

m.  $\frac{x^3-8}{x^2-4}$

n.  $\frac{\frac{x}{x+2} - \frac{x}{x-2}}{\frac{x}{x+2} + \frac{x}{x-2}}$

o.  $\log_2 5 - 2\log_2 .5 + \log_2 1.6$

p.  $450^0 - 1^{450} + \ln e - \log_5 5 + i^6$

9. Factor the following, if possible.

a.  $4a^2 - 9b^2$

b.  $2y^3 - 22y^2 + 48y$

c.  $4c^3 - 4c^2d + cd^2$

d.  $2am - 3an + 2bm - 3bn$

10. Solve by completing the square.

a.  $x^2 - 10x = 1575$

b.  $x^2 + 6x + 10 = 0$

11. Solve using the quadratic formula.

a.  $5x^2 + 2x - 1 = 0$

b.  $3t^2 = 12t - 15$

12. Find the value of each expression. Make a sketch of each angle.

a.  $\csc(210^\circ)$

b.  $\sec(180^\circ)$

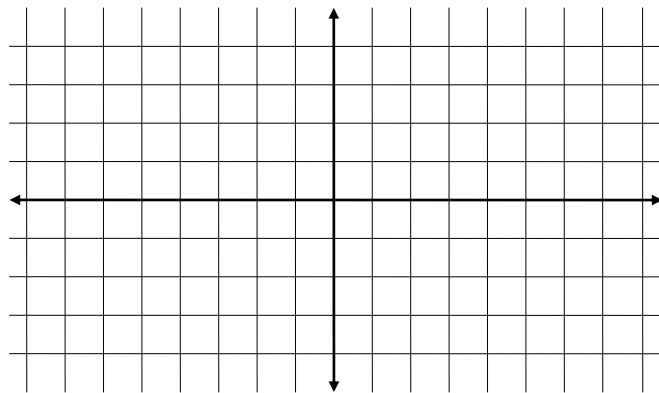
c.  $\cot(0^\circ)$

d.  $\tan\left(\frac{7\pi}{4}\right)$

e.  $\cos\left(\frac{7\pi}{6}\right)$

f.  $\sin\left(-\frac{5\pi}{3}\right)$

13. Sketch the graph of  $y = x^2 - 2x - 8$ . Label the vertex, the axis of symmetry, and the  $x$ - and  $y$ - intercepts.



14. Divide  $2x^4 - 15x^2 - 10x + 5$  by  $x - 3$  using long division.

15. Divide  $x^4 - 2x^3 + 5x + 2$  by  $x + 1$  using synthetic division.

16. Consider the equation  $2x^3 - 5x^2 - 4x + 3 = 0$ . If it is known that one root is  $x = 3$ , find the remaining roots. *Hint:* Divide.

17. Find the center and radius of the following circles. *Hint:* You may need to complete the square.

a.  $(x - 3)^2 + (y + 4)^2 = 25$

b.  $x^2 - 6x + y^2 - 8y = 11$

18. Let  $f(x) = 2x^2 + 3$  and  $g(x) = x + 1$ . Find the following.

a.  $(f + g)(-1)$

b.  $(f \cdot g)(2)$

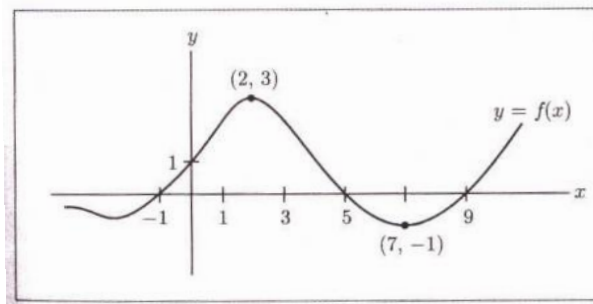
c.  $(f - g)(x)$

d.  $f(g(3))$

e.  $g(f(-4))$

f.  $f \circ g(x)$

19. Consider the following graph.



a. Find  $f(0)$ ,  $f(2)$ ,  $f(7)$  and  $f(-1)$ .

b. Is  $f(4)$  positive or negative?

c. Is  $f(1) > f(6)$ ?

d. For what values of  $x$  is  $f(x) = 0$ ?

e. For what values of  $x$  is  $f(x) \geq 0$ ?

20. A ball is thrown into the air, and its height  $h$  is given by this equation, in terms of time

t:  $h(t) = -16t^2 + 88t + 8$

a. At time  $t = 0$  what is the height of the ball? This is how high above the ground the ball is at the instant it leaves my hand.

b. Since the equation is a quadratic, which direction does it open...up, down, left, right? Remember, x-axis is time and y-axis is height

c. How high does the ball travel? (This will be at the maximum point, right...the vertex, right?)

d. At what time does the ball hit the ground? (This is when the height is 0.)