11th Grade Assignment – Week #5

Announcements:

- Next week's assignment will include a test on *Cartesian Geometry – Part I* (from the workbook). You will take this test at home, and then send it to your tutor when you are finished.
- There is graph paper on the next page. You may wish to print several copies of that one page.

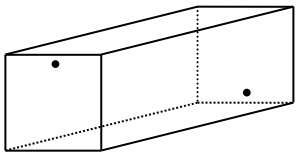
Individual Work

- Do as much as you can with the problems on **Problem Sets #4-6**, from the workbook unit, **Cartesian Geometry – Part I.**
  Important Note: Because this material is so fundamental for all future math studies, even if you are already familiar with this material, it is important that you carefully look through all the problems (you don't have to do them all), to make sure that you really know how to do all of them.

Group Assignment:

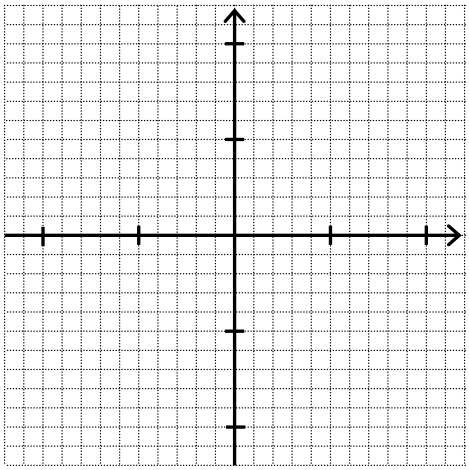
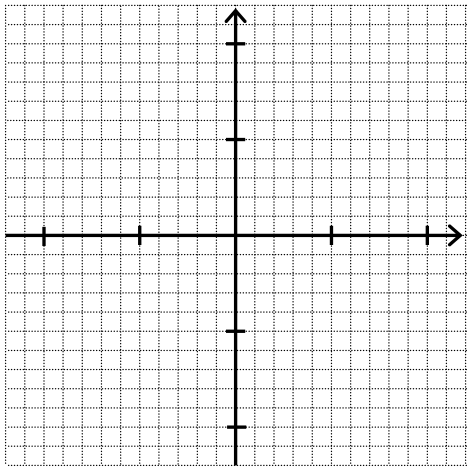
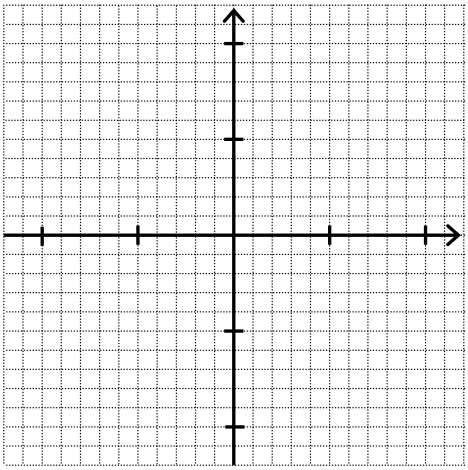
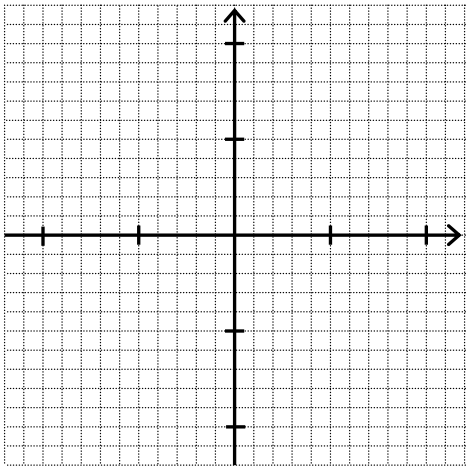
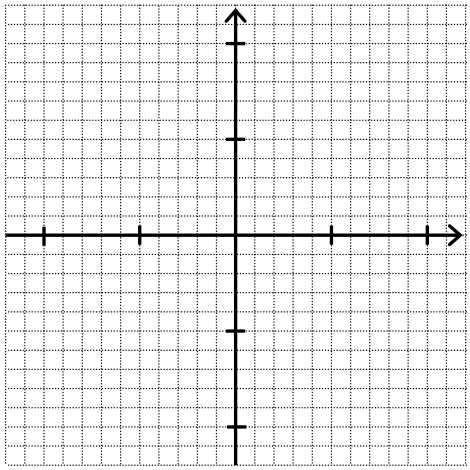
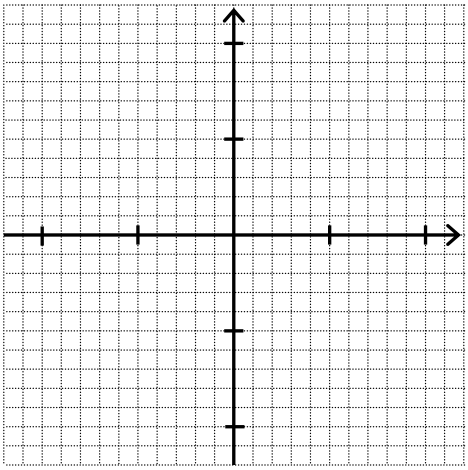
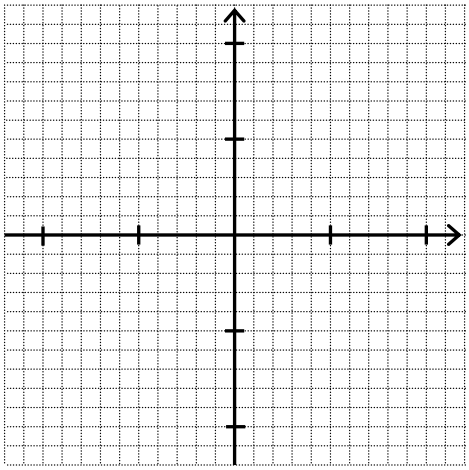
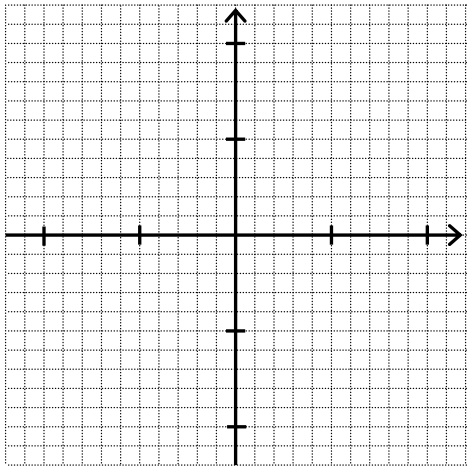
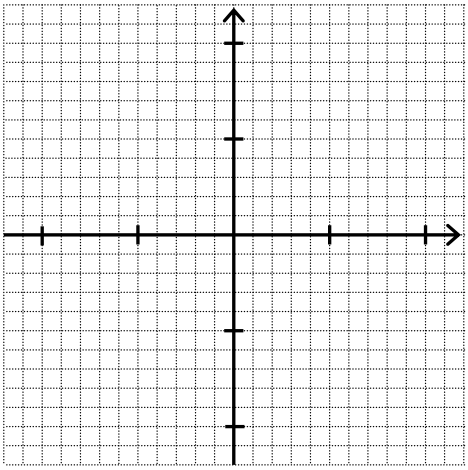
- Help each other out with the problems from the Individual Work (above).
  Especially focus on the more challenging problems.
  Again, this work is important; make sure everyone understands!
- **The Two-Ant Puzzle – Part II.**

  A. The male ant is on the front square wall of the box (which again measures 24x24x60 cm), equally far from each of the rectangular side walls and 2cm from the ceiling. The female is diametrically opposite the male – i.e., on the back wall two inches up from the floor, and equally far from the side walls. How long is the shortest path that goes from one ant to the other?



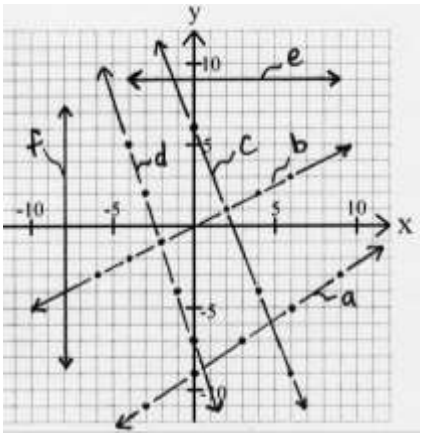
  B. Where would the two ants be situated such that they are as far apart as possible? (The distance between any two points is again defined as the shortest path that can be walked by an ant from one point to the other point.)

  C. *Crazy Challenge!* If the male ant is at the left top front corner of the box, where would the female ant need to be situated in order to be as far away as possible from the male ant? (Hint: It's close to, but not exactly on, the diametrically opposite corner.)

Problem Set #4

1) Give the equation of each line both in slope-intercept form and in standard form.



2) Give the equation of the line that…

a) Has a slope of –3 and passes through (–2,7).
b) Has a slope of ⅔ and a y-intercept of 5.
c) Passes through (–5, –3) with a y-intercept of 2.
d) Passes through the points (6,5) and (3,4).
e) Passes through the points (6,5) and (–3,–7).
f) Passes through the points (6,5) and (2,2).
g) Passes through the points (6,5) and (–4,–3).

3) Give three other equations that have the same solutions as $y = \frac{1}{2}x + 3$

Three Methods

Here are the three common methods for finding the common solution to two linear equations:

- The *substitution method*
- The *graphing method* (as done at the end of the previous problem set.)
- The *linear combination method.* This method may be new to you, so here is an example:

Example: Use the *linear combination method* to find the common solution to these two equations:

$2x + 3y = 4$
$3x – 4y = 23$

Solution: We can choose to either have the x's cancel or the y's cancel. In this case, we will choose to cancel the x's. To do this, I multiply the top equation by 3, and the bottom by –2. So now the equations are:

$6x + 9y = 12$
$–6x + 8y = –46$

It is important to realize that these two equations are equivalent (i.e., they have the same solutions) as the original two equations.

Here's the key: we simply add the two equations together, and the x's cancel. That's why we changed the equations to begin with!

Now we have: $17y = –34$

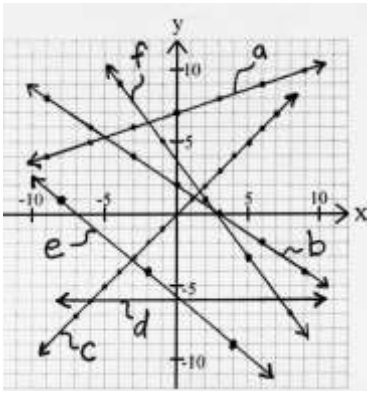
This gives us $y = –2$ as a solution, and by substituting in for y, we get $x = 5$. The common solution to the two original equations is (5, –2).

4) Use each of the three methods to find the common solution to

$2y + 3x = –10$
$6y – 5x = 26$

Problem Set #5

1) Give the equation of each line both in slope-intercept form and in standard form.



2) Graph each equation.

a) $y = \frac{3}{4}x + 2$

b) $y = -2x + 7$

c) $y + 2x = 7$

d) $x + 2y = 7$

e) $3x - 5y = 10$

f) $3y + 2x = 5$

g) $y = -x$

h) $x = 4$

i) $y = -x^2 + 6x - 9$

3) Consider the equation $2x - 3y = 12$.

a) What is the slope of its graph?

b) What is the y-intercept?

c) What is the x-intercept?

d) Where is $x = -3$?

e) Give three solutions to the equation.

f) For which point is the value of x and y the same?

g) What solution does it have in common with
$x + 3y = 15$

Temperature Conversions

4) The formula for converting from Celsius to Fahrenheit is:

$$F = \frac{9}{5} \cdot C + 32$$

a) What does the 32 indicate?

b) What does the $^9/_5$ indicate?

Use a full-size sheet of graph paper to graph the above equation. The vertical axis should be F, and the horizontal axis should be C. Both axes should have a range from –100 to 100.

Use this graph to estimate the answers to the following:

c) Convert 95°F to °C

d) Convert 10°C to °F

e) Convert 43°F to °C

f) Convert 43°C to °F

5) The formula for converting from Fahrenheit to Celsius is:

$$C = \frac{5}{9} \cdot (F - 32)$$

Multipying in gives us:

$$C = \frac{5}{9}F - 17\frac{7}{9}$$

a) What does the $17\frac{7}{9}$ indicate?

b) What does the $^5/_9$ indicate?

Use a full-size sheet of graph paper to graph the above equation. The vertical axis should be C, and the horizontal axis should be F. Both axes should have a range from –100 to 100.

Use this graph to estimate the answers to the following:

c) Convert 95°F to °C

d) Convert 10°C to °F

e) Convert 43°F to °C

f) Convert 43°C to °F

6) a) If the graphs from problems #4 and #5 are superimposed upon each other, where would the lines meet?

b) What is the significance of this meeting point?

7) Give the equation of the line that…

a) Has a slope of $^2/_3$ and a y-intercept of (0,6).

b) Has a slope of –5 and passes through the point (2,–7).

c) Passes through the points (3,–2) and (–6,–5).

d) Passes through the points (10,6) and (5,4).

e) Passes through the points (10,6) and (4,2).

f) Passes through the point (3,–2) and runs parallel to the line $y = -2x + 9$

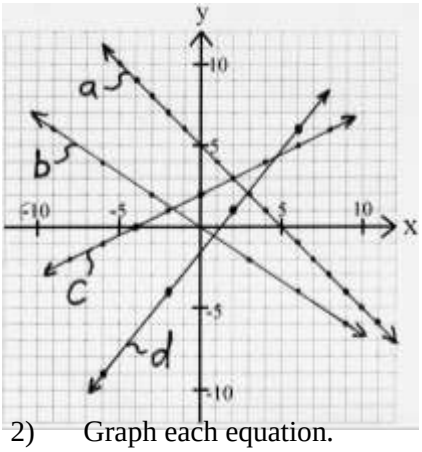
g) Passes through the point (–1,4) and is perpendicular to the line $y = \frac{3}{4}x - 5$

8) Use the linear combination method to find the common solution to:
$5x - 6y = 31$
$3x + 4y = -8$

9) Use each of the three methods to find the common solution to
$x + 2y = 2$
$4x - 3y = 30$

Problem Set #6

1) Give the equation of each line.



2) Graph each equation.
   a) $y = -\frac{1}{2}x$
   b) $y = \frac{3}{4}x - 5$
   c) $6y + 5x = 18$
   d) $3y + 7x = -18$

3) Use both the graphing method and the linear combination method to find the common solution to the equations given in #2c and #2d above.

4) Use both the graphing method and the substitution method to find the common solution to the equations given in #2b and #2c above.

5) Give the equation of the line that…
   a) Has a slope of $\frac{2}{3}$ and passes through the point $(-6,1)$.
   b) Passes through the points $(2,-5)$ and $(6,-7)$.
   c) Passes through the points $(1,7)$ and $(-3,5)$.
   d) Passes through the point $(10,4)$ and runs parallel to
      $y = -\frac{2}{5}x + 20$.
   e) Passes through the point $(10,4)$ and is perpendicular to $y = -\frac{2}{5}x + 20$.

6) Jason currently has $3,400 of debt from an interest free loan, and he has a total of $400 in savings. He decides that starting today he will pay $100 per month toward his debt and that he will also save an additional $150 per month by putting it under his mattress (therefore no interest).
   a) Give an equation that expresses the balance of his debt over time.
   b) Give an equation that expresses his total savings over time.
   c) Graph the two above equations on the same graph.
   d) How much savings will he have after 2 years?
   e) When will he have $1600 in savings?
   f) When will his debt finally be zero?
   g) Where do the two graphs meet? What is the significance of that point?