Mathematics 1275CO/OL27, Fall 2021 **Exam #1**
Instructor: Suman Ganguli **Due: Friday, October 8** **Name:** _____

Question:	1	2	3	4	Total
Points:	10	15	15	10	50
Score:					

In order to receive full credit, you must **show all your work** and simplify your answers.

1. (10 points) Consider the following 2x2 system of linear equations:

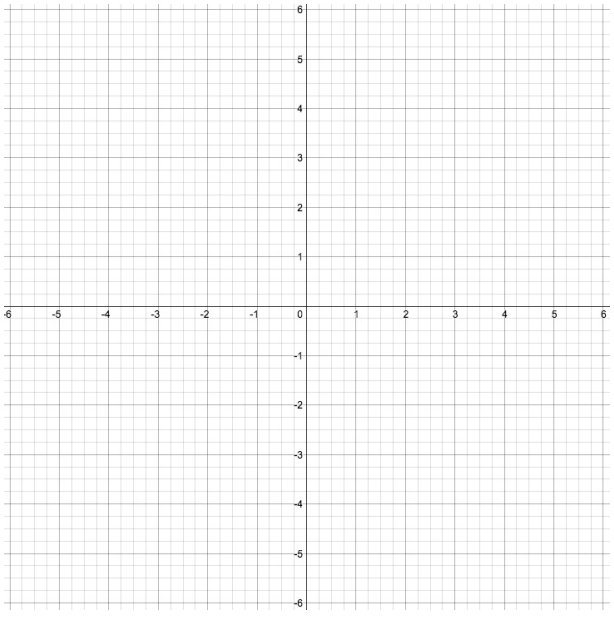
   $3x - 2y = 6$

   $5x + 2y = 10$

   (a) Solve the system of equations algebraically, using the addition/elimination method (i.e., add the two equations so as to eliminate the variable y and solve for x; then solve for y). Express your solution as a point (x, y):

   (b) Put each of the two given equations in slope-intercept form:

   (c) Verify your solution from (a) graphically:
   - Use the slope-intercept form of each linear equation to plot the y-intercept and one other point on each line
   - Label each of these four points with their coordinates, and use them to sketch the two lines
   - Label the point where the two lines intersect (hint: it should be the same as your solution to (a)!)



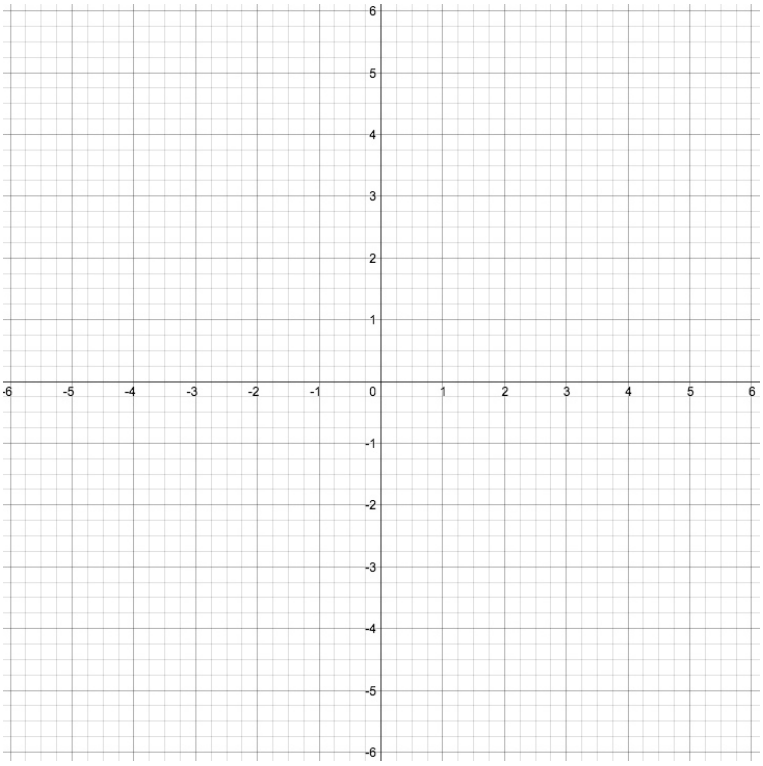
2. (15 points) Consider the line passing through the point $(3, -1)$ with slope $m = \frac{2}{3}$.

   (a) Write down the equation of the line in point-slope form:

   (b) Simplify your answer from (a) to get the equation of the line in slope-intercept form:

   (c) Using either of the equivalent equations of the line from (a) and (b), algebraically solve for the x-intercept (i.e., plug in $y = 0$ and solve for x):

   (d) Sketch a graph of the line. Label the given point $(3, -1)$ and the x- and y-intercepts with their (x, y) coordinates:



   (e) Write down the equations of the following two lines:

   - *parallel* to the line above and passing through the origin:
   - *perpendicular* to the line above and passing through the origin:

   Add both of these lines to your graph above.

3. (15 points) Solve the following quadratic equations by factoring and using the Zero Product Property (i.e., do *not* use the quadratic formula!)

   (a) $x^2 - 21x - 100 = 0$

   (b) $x^2 - 64 = 0$
   (Hint: factor the LHS as a difference of squares!)

   (c) $4x^2 + 9x + 5 = 0$
   (Hint: you can use the *ac*-method to factor the LHS. Remember to show all your work!)

   Extra credit: check your solutions to (c) by showing that each solution satisfies the original equation.

4. (10 points) Solve the following quadratic equations using the Square Root Property. **Simplify the solutions as much as possible. Also check your solutions by substituting into the original equation.**

(a)

$$x^2 - 28 = 0$$

(Note: in order to simplify the solutions, use the fact that $\sqrt{28} = \sqrt{4 * 7} = \sqrt{4}\sqrt{7} = 2\sqrt{7}$)

(b)

$$(x + 2)^2 = 9$$

(c)

$$(x - 5)^2 = 41$$

Extra credit: Put the quadratic equations given in (b) and (c) in standard form, i.e., in the form $ax^2 + bx + c = 0$: