Math 254N ASSIGNMENT 2, SPRING 2018 **Do by Thursday, April 12th**

This assignment is not to turn in, but you need to try all of it by class on Thursday. We'll go over it BRIEFLY in class, and you probably won't get much out of that if you haven't tried this beforehand.

The pair of equations in each of Exercises 1-6 below gives the position of a "particle" at any time t. Do the following for each.

(a) On separate paper, make a table of t, x and y values for $t = 0, 1, 2, 3$.

(b) Plot the xy pairs obtained on the appropriate grid below, and sketch in what you think the path of the particle is. For number 2, only plot the positions for $t = 0, 1, 2$. **Next to each point plotted, write in $t =$ the time value for the particular point.**

1. $x = t - 2,\ y = 3t - 5$

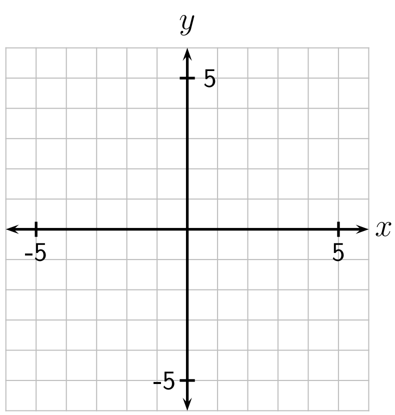
2. $x = t^2 - 2,\ y = 3t^2 - 5$

3. $x = 4\sin\left(\frac{\pi}{2}\,t\right),\ y = 4\cos\left(\frac{\pi}{2}\,t\right)$

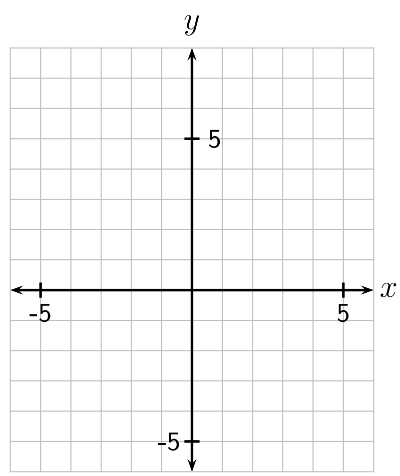
4. $x = -4\sin\left(\frac{3\pi}{2}\,t\right),\ y = 4\cos\left(\frac{3\pi}{2}\,t\right)$

5. $x = t^2 - 3,\ y = t - 1$

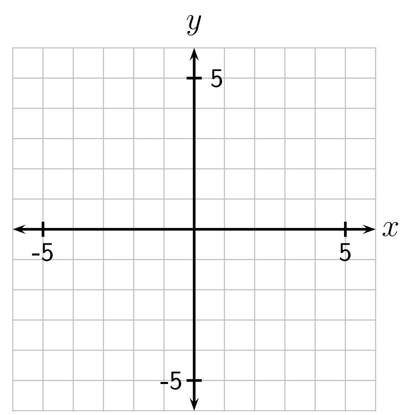
6. $x = 3\sin\left(\frac{\pi}{2}\,t\right),\ y = 5\cos\left(\frac{\pi}{2}\,t\right)$



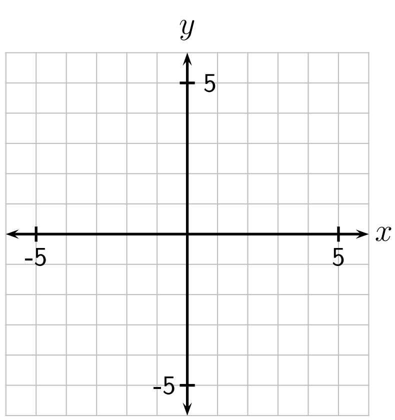
Exercise 1



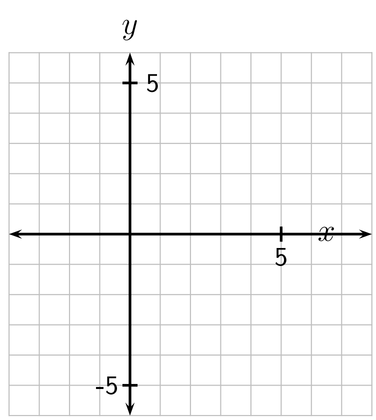
Exercise 2



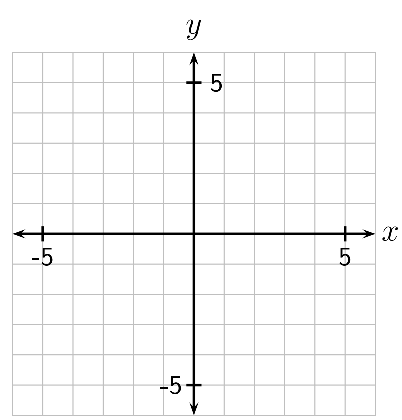
Exercise 3



Exercise 4



Exercise 5



Exercise 6

Consider the Lines 1 and 3 from the previous assignment:

Line 1:	$x = 5 + t,$	$y = 8 + 3t,$	$z = -3 - 2t$
Line 3:	$x = -2 + 2t$	$y = 1 - t,$	$z = 1 + t$

7. Two lines that are not parallel or the same line are called **skew** if they do not intersect. In this exercise we will attempt to find a point that Lines 1 and 3 have in common. If we are successful, then the lines intersect. If we are not successful they are skew.

   (a) Replace the parameter t with s in the set of parametric equations for Line 3.

   (b) We now wish to see if there are values of s and t that make the x, y and z values equal. Set the x's and y's from the two sets of equations equal to get two equations in the two unknowns s and t. Solve for s and t.

   (c) If you didn't make any mistakes so far, those values of s and t should result in the same x and y values in the two sets of parametric equations. Check to see if that is the case.

   (d) Now we must check to see if the s and t that you found will give the same z values as well. See if that is the case. If it is, give the point where the two lines cross. If that is not the case, then the lines are skew. If that is the case, say so.

Math 254N ASSIGNMENT 2, SPRING 2018 **Due Friday, April 13th**

1. Consider now the three planes

   Plane 1: $2x - y + 3z = 7$ **Plane 2:** $x + 6y + 4z = -5$ **Plane 3:** $-4x + 2y - 6z = 1$

   (a) Give a normal vector to each plane.

   (b) Two planes are parallel if their normal vectors are. Are any of the planes parallel? If so, tell which ones.

   (c) Do you think any of the planes are perpendicular? Why or why not?

   (d) What relationship must the normal vector of a plane and direction vector of a line have if the line is parallel to the plane? Are any of the lines from Exercise 1 of Assignment 1 parallel to any of the planes from Exercise 2?

2. For this exercise you'll work with Line 1 from Exercise 7 above and Plane 1 from Exercise 3. The point of this exercise is to determine where the line intersects the plane, if it does.

   (a) If the line intersects the plane there must be some value of t that gives a point on the line that is also on the plane. Substitute the line equations into the plane equation to get an equation with the unknown t.

   (b) Put your value of t into the line equations to find the point where the line intesects the plane.

   (c) Verify that the point does indeed line on the plane by showing that its coordinates make the plane equation true.