Names: ______________________ ______________________ ______________________

Activity #1: Some Geometry (Solutions) **College Algebra**

1. Find an equation for the line passing through the point $(6, -3)$ and having slope -2/3.

   Solution: Remember that to uniquely identify a line in the plane, we need two pieces of information. In this case we know two things about this line: its slope, and a point on the line. The simplest linear equation form to use here is the point-slope form: the line with slope m and passing through the point (h, k) is given by the equation
$$\frac{y-k}{x-h} = m.$$
   Here we have $m = -2/3$ and $(h, k) = (6, -3)$. So this line is given by the equation
$$\frac{y+3}{x-6} = \frac{-2}{3}.$$
   We can solve this equation for y to find the slope-intercept form; this yields
$$\boxed{y = -\frac{2}{3}x + 1}$$
   .

2. Find the slope between the points $(6, -2)$ and $(-4, -6)$.

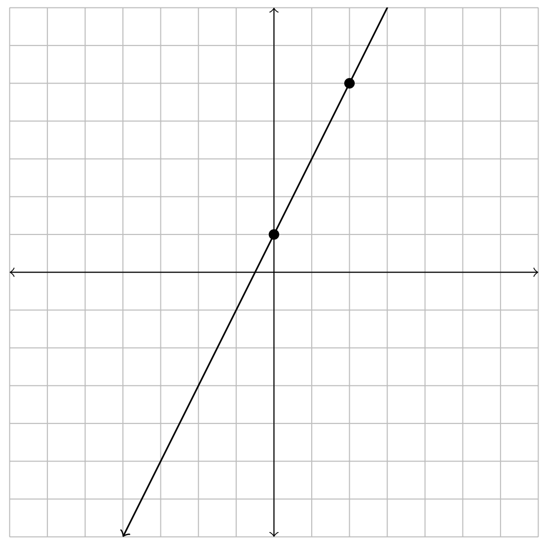
   Solution: Remember that the slope between the points (x_1, y_1) and (x_2, y_2) is
$$\frac{y_2 - y_1}{x_2 - x_1}.$$
   Here, we have $(x_1, y_1) = (6, -2)$ and $(x_2, y_2) = (-4, -6)$, so that the slope between them is
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{(-6) - (-2)}{(-4) - (6)} = \frac{-4}{-10}.$$
   So the slope between these points is $\boxed{2/5}$.

3. Find the distance between the points $(1, -1)$ and $(2, 3)$.

   Solution: Remember that the formula for the distance between (x_1, y_1) and (x_2, y_2) is
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$
   Here we have $(x_1, y_1) = (1, -1)$ and $(x_2, y_2) = (2, 3)$, so that the formula gives
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{((2) - (1))^2 + ((3) - (-1))^2} = \sqrt{(1)^2 + (4)^2} = \sqrt{17}.$$
   So the distance between these points is $\boxed{\sqrt{17}}$.

4. Plot the graph of the linear equation $y = 2x + 1$ on the plane below.

   Solution: This line as slope $4/2$ and y-intercept 1. We can use this information to find two points on the line and sketch as follows.



5. Find the slope between the points $(5, 7)$ and $(5, -5)$.

   Solution: Remember that the slope between the points (x_1, y_1) and (x_2, y_2) is

$$\frac{y_2 - y_1}{x_2 - x_1}.$$

   Here, we have $(x_1, y_1) = (5, 7)$ and $(x_2, y_2) = (5, -5)$, so that the slope between them is

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{(-5) - (7)}{(5) - (5)} = \frac{-12}{0}.$$

   We have a problem: the denominator of this fraction is zero. So the slope between these points is $\boxed{\text{undefined}}$.

6. Find the midpoint of the points $(2, 7)$ and $(-1, 4)$.

   Solution: Remember that the midpoint of the points (x_1, y_1) and (x_2, y_2) is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right).$$

   Here, we have $(x_1, y_1) = (2, 7)$ and $(x_2, y_2) = (-1, 4)$, so that the midpoint is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{(2) + (-1)}{2}, \frac{(7) + (4)}{2}\right) = \left(\frac{1}{2}, \frac{11}{2}\right).$$

   So the midpoint is $\boxed{(1/2, 11/2)}$.

7. Find an equation for the circle centered at $(3, -3)$ and having radius 5.

   Solution: Remember that the standard form equation of a circle centered at the point (h, k) and with radius r is
   $$(x - h)^2 + (y - k)^2 = r^2.$$
   Here we have $(h, k) = (3, -3)$ and $r = 5$; so this circle is given by the equation
   $$\boxed{(x - 3)^2 + (y + 3)^2 = 25}.$$

8. Find an equation for the circle centered at $(4, -4)$ and passing through $(-5, -3)$.

   Solution: The radius of this circle is the distance from the center, $(4, -4)$, to the point $(-5, -3)$. That distance is
   $$\sqrt{82}.$$
   Now the circle with center at (h, k) and radius r is given by the equation
   $$(x - h)^2 + (y - k)^2 = r^2.$$
   Thus this circle is given by the equation
   $$\boxed{(x - 4)^2 + (y + 4)^2 = 82}.$$

9. Find an equation for the line passing through the points $(3, 4)$ and $(-1, 1)$.

   Solution: We will find the point-slope form of this line. First, using the slope formula, we find that the slope of this line is
   $$m = \frac{(1) - (4)}{(-1) - (3)} = 3/4.$$
   Since we know this line passes through (for instance) $(3, 4)$, using the point-slope formula, an equation for this line is
   $$\frac{y - 4}{x - 3} = 3/4.$$
   We can solve for y to get this equation in slope-intercept form as follows:
   $$\boxed{y = \frac{3}{4}x + \frac{7}{4}}$$

10. Convert the standard form linear equation
    $$-y + x = -7$$
    to slope-intercept form.

Solution: To convert to slope-intercept form, we simply solve this equation for y to get

$$\boxed{y = x + 7}$$

Find an equation in slope-intercept form for the line passing through the point $(3, 1)$ and parallel to $y = \frac{1}{2}x+1$.

Solution: Let ℓ be the unknown line. Since ℓ is known to be parallel to $y = \frac{1}{2}x + 1$, the slope of ℓ is $m = 1/2$. We also know that ℓ passes through the point $(3, 1)$. So ℓ is given by the point-slope form equation

$$\frac{y-1}{x-3} = 1/2.$$

Solving for y yields the slope-intercept equation

$$\boxed{y = \frac{1}{2}x - \frac{1}{2}}$$