Names: ______________________ ______________________ ______________________

Activity #2: Some Geometry (Solutions) **College Algebra**

1. Find an equation for the line passing through the point $(6, 5)$ and having slope $2/5$.

   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 $m = 2/5$ and $(h, k) = (6, 5)$. So this line is given by the equation
$$\frac{y-5}{x-6} = \frac{2}{5}.$$
   We can solve this equation for y to find the slope-intercept form; this yields
$$\boxed{y = \frac{2}{5}x + \frac{13}{5}}$$
   .

2. Find the slope between the points $(7, -6)$ and $(-2, 3)$.

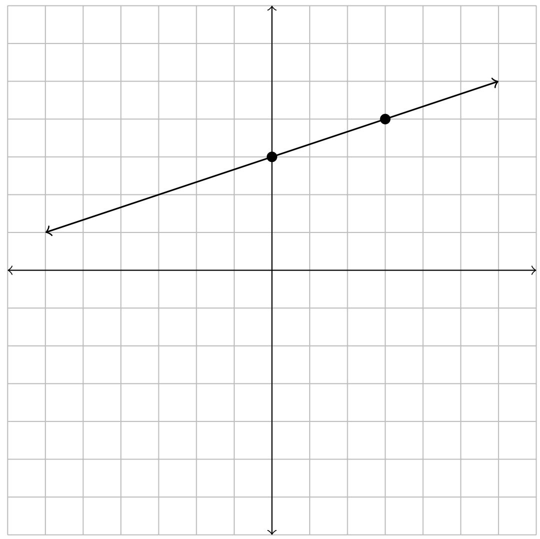
   Solution: Remember that the slope between the points (x_1, y_1) and (x_2, y_2) is
$$\frac{y_2 - y_1}{x_2 - x_1}.$$
   Here, we have $(x_1, y_1) = (7, -6)$ and $(x_2, y_2) = (-2, 3)$, so that the slope between them is
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{(3) - (-6)}{(-2) - (7)} = \frac{9}{-9}.$$
   So the slope between these points is $\boxed{\text{-1}}$.

3. Find the distance between the points $(-4, 4)$ and $(-1, 3)$.

   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 $(x_1, y_1) = (-4, 4)$ and $(x_2, y_2) = (-1, 3)$, so that the formula gives
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{((-1) - (-4))^2 + ((3) - (4))^2} = \sqrt{(3)^2 + (-1)^2} = \sqrt{10}.$$
   So the distance between these points is $\boxed{\sqrt{10}}$.

4. Plot the graph of the linear equation $y = \frac{1}{3}x + 3$ on the plane below.

   Solution: This line as slope $1/3$ and y-intercept 3. We can use this information to find two points on the line and sketch as follows.



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

   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 $(x_1, y_1) = (1, -3)$ and $(x_2, y_2) = (1, -2)$, so that the slope between them is

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{(-2) - (-3)}{(1) - (1)} = \frac{1}{0}.$$

   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 $(7, 5)$ and $(-6, 5)$.

   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 $(x_1, y_1) = (7, 5)$ and $(x_2, y_2) = (-6, 5)$, so that the midpoint is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{(7) + (-6)}{2}, \frac{(5) + (5)}{2}\right) = \left(\frac{1}{2}, \frac{10}{2}\right).$$

   So the midpoint is $\boxed{(1/2, 5)}$.

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

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 $(h, k) = (7, -3)$ and $r = 7$; so this circle is given by the equation

$$\boxed{(x-7)^2 + (y+3)^2 = 49}.$$

8. Find an equation for the circle centered at $(2, -1)$ and passing through $(-5, -3)$.

Solution: The radius of this circle is the distance from the center, $(2, -1)$, to the point $(-5, -3)$. That distance is

$$\sqrt{53}.$$

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

$$\boxed{(x-2)^2 + (y+1)^2 = 53}.$$

9. Find an equation for the line passing through the points $(1, -6)$ and $(-5, 6)$.

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

$$m = \frac{(6) - (-6)}{(-5) - (1)} = -2.$$

Since we know this line passes through (for instance) $(1, -6)$, using the point-slope formula, an equation for this line is

$$\frac{y+6}{x-1} = -2.$$

We can solve for y to get this equation in slope-intercept form as follows:

$$\boxed{y = -2x - 4}$$

10. Convert the standard form linear equation

$$-3y + 6x = -2$$

to slope-intercept form.

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

$$\boxed{y = 2x + \frac{2}{3}}$$

11. Find an equation in slope-intercept form for the line passing through the point $(4, 1)$ and parallel to $y = \frac{1}{2}x + 2$.

    Solution: Let ℓ be the unknown line. Since ℓ is known to be parallel to $y = \frac{1}{2}x + 2$, the slope of ℓ is $m = 1/2$. We also know that ℓ passes through the point $(4, 1)$. So ℓ is given by the point-slope form equation

    $$\frac{y - 1}{x - 4} = 1/2.$$

    Solving for y yields the slope-intercept equation

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