Quiz 4

Due Wednesday, December 8

1. Find the equation of the line through (-1, -3) and perpendicular to
a. $y = 2x + 1$
b. $y = -2x + 3$
c. $x = -4$
d. $y = -3$

2. For parts a and b, draw a picture of the translation.
2a. Let A be the point $(1, 4)$. Apply the translation $(x, y) \to (x + 2, y - 3)$ to A. Call the resuling point A'.
2b. Apply the translation $(x, y) \to (x - 5, y + 4)$ to A'. Call the resulting point A''.
2c. Describe a single translation that sends A to A'' directly.
2d. Guess a formula that combines two translations $(x, y) \to (x + h_1, y + k_1)$ and $(x, y) \to (x + h_2, y + k_2)$ into a single equivalent translation.

3. Find the coordinates of the image of the point $(0, 7)$ after rotation $30°$ clockwise about the point $(0, 2)$.

4. Find the equation of image of the line $y = 2x + 1$ after reflection over
4a. the x-axis.
4b. the y-axis.
4c. the line $y = x$.

5. Describe all line and rotational symmetries (if any) of the following quadrilaterals. For line symmetries, draw a picture of the polygon together with all its lines of symmetry. For rotational symmetries, give the angle of the symmetry.
5a. paralellogram
5b. rhombus

5c. rectangle

5d. square

Hints

1a. Slope of perpendicular line is the negative reciprocal of the given line. To find b, plug in a point and solve.

1b. Slope of perpendicular line is the negative reciprocal of the given line. To find b, plug in a point and solve.

1c. The line $x = -4$ is vertical, so a line perpendicular to it will be horizontal.

1d. The line $y = -3$ is horizontal, so a line perpendicular to it will be vertical.

2a. Just follow the recipe given in the translation.

2b. Just follow the recipe given in the translation.

2c. Look at the coordinates of A and A''. How do the x-coordinates and y-coordinates change?

2d. Compare the translations you did in parts a and b to the translation you got in c.

3. If we let (x, y) be the image of $(0, 7)$ after rotation, then we can make a right triangle whose vertices are $(0, 2)$, $(0, y)$, and (x, y) (see the notes for an example). You know the hypotenuse and one of the angles, so you can use trigonometry to find (x, y).

4a. Pick any two points on the line $y = 2x + 1$, reflect them both over the x-axis, then find the equation of the line passing through these two new points.

4b. Pick any two points on the line $y = 2x + 1$, reflect them both over the y-axis, then find the equation of the line passing through these two new points.

4c. Pick any two points on the line $y = 2x + 1$, reflect them both over the line $y = x$, then find the equation of the line passing through these two new points.

5. For all of these, draw a typical picture and think about which flips and turns will leave the shape unchanged. Be sure you don't impose more structure than you actually have. For example, if you are drawing a parallelogram, make sure you aren't drawing a rhombus by mistake.