Lesson 7: Equations for Lines Using Normal Segments

Classwork

Opening Exercise

The equations given are in standard form. Put each equation in slope-intercept form. State the slope and the y-intercept.

1. $6x + 3y = 12$
2. $5x + 7y = 14$
3. $2x - 5y = -7$

Example 1

Given $A(5, -7)$ and $B(8, 2)$:

a. Find an equation for the line through A and perpendicular to $\overline{AB}$.

b. Find an equation for the line through B and perpendicular to $\overline{AB}$.

Exercises 1–2

1. Given $U(-4,-1)$ and $V(7,1)$:
   a. Write an equation for the line through U and perpendicular to $\overline{UV}$.

   b. Write an equation for the line through V and perpendicular to $\overline{UV}$.

2. Given $S(5,-4)$ and $T(8,12)$:
   a. Write an equation for the line through S and perpendicular to $\overline{ST}$.

   b. Write an equation for the line through T and perpendicular to $\overline{ST}$.

Closing

Describe the characteristics of a normal segment.

Every equation of a line through a given point (a, b) has the form $A(x - a) + B(y - b) = 0$. Explain how the values of A and B are obtained.

Problem Set

1. Given points $C(-4,3)$ and $D(3,3)$:
   a. Write the equation of the line through C and perpendicular to $\overline{CD}$.
   b. Write the equation of the line through D and perpendicular to $\overline{CD}$.

2. Given points $N(7,6)$ and $M(7,-2)$:
   a. Write the equation of the line through M and perpendicular to $\overline{MN}$.
   b. Write the equation of the line through N and perpendicular to $\overline{MN}$.

3. The equation of a line is given by the equation $8(x-4)+3(y+2)=0$.
   a. What are the coordinates of the image of the endpoint of the normal segment that does not lie on the line? Explain your answer.
   b. What translation occurred to move the point of perpendicularity to the origin?
   c. What were the coordinates of the original point of perpendicularity? Explain your answer.
   d. What were the endpoints of the original normal segment?

4. A coach is laying out lanes for a race. The lands are perpendicular to a segment of the track such that one endpoint of the segment is $(2,50)$ and the other is $(20,65)$. What are the equations of the lines through the endpoints?