2.3 Equations of a Line

1. Definition:

a. To write an equation of a line, we need **a slope** and **a point**.

b. **Point-slope form:** $y - y_1 = m(x - x_1)$
Slope-intercept form: $y = mx+b$, where m is the slope and $(0, b)$ is the y-intercept.

Example 1: *Finding the Slope and y-intercept of a Line:*

Given $3x + 4y = 4$, write the equation of the line in slope-intercept form. Then find the slope and y-intercept.

Your Turn: Write the equation in slope-intercept form. Determine the slope and y-intercept. $2x - 4y = 3$

Example 2: *Graphing a Line using the slope and y-intercept:*

Graph the equation $y = -\frac{3}{4}+1$ using the slope and y-intercept.

Your Turn: Graph the equation $y = \frac{1}{5}-2$ using the slope and y-intercept

Example 3: *Determining if two lines are parallel, perpendicular, or neither:*
Given the equation for two lines L_1 and L_2, determine if the lines are parallel, perpendicular, or neither.

a. $L_1 : y = -2x + 7$
$L_2 : y = -2x - 1$

b. $L_1 : 2y = -3x + 2$
$L_2 : -4x + 6y = -12$

c. $L_1 : x + y = 6$
$L_2 : y = 6$

Example 4: *Using slope-intercept form to find an equation of a line:*

Use slope-intercept form to find an equation of the line with slope -3 and passing through the point (1, -4)

Your Turn: Use slope-intercept form to find an equation of the line with slope 2 and passing through the point (-3, -5)

Example 5: *Using the point-slope formula to find an equation of a line:*

Use the point-slope formula to find an equation of the line having a slope of -3 and passing through the point $(1, -4)$. Write the answer in slope-intercept form.

Your Turn: Use the point-slope formula to find an equation of the line having a slope of -5 and passing through the point $(-2, -6)$. Write the answer in slope-intercept form.

Example 6: *Finding an equation of a line given two points:*

Find an equation of the line passing through $(5, -1)$ and $(3, 1)$. Write the answer in slope-intercept form.

Your Turn: Find an equation of the line passing through $(-5, 2)$ and $(-1, -1)$. Write the answer in slope-intercept form.

Example 7: *Finding an equation of a line parallel to another line:*

Find an equation of the line passing through the point $(-2, -3)$ and parallel to the line $4x + y = 8$. Write the answer in slope-intercept form.

Your Turn: Find an equation of the line passing through the point $(4, -1)$ and parallel to the line $2x = y - 7$. Write the answer in slope-intercept form.

Example 8: *Finding an equation of a line perpendicular to another line:*

Find an equation of the line passing through the point $(4, 3)$ and perpendicular to the line $2x + 3y = 3$. Write the answer in slope-intercept form.

Your Turn: Find an equation of the line passing through the point $(1, -6)$ and perpendicular to the line $x + 2y = 8$. Write the answer in slope-intercept form.