• **Linear functions:** A function \( f \) is a linear function if it can be written as
\[
f(x) = mx + b
\]
where \( m \) and \( b \) are constants. The graph of a linear function is always a straight line.

• **Horizontal lines:** Horizontal lines are given by equations of the type \( y = b \) or \( f(x) = b \).

• **Vertical lines:** Vertical lines are given by equations of the type \( x = c \).

• **To find the equation of a line:** In order to find the equation of any line (that is not horizontal or vertical) we will always need two items: the slope and a point on the line. Once we have these two items, we need to use either the **slope-intercept form** or the **point-slope formula** to find the equation of the line. Although we have already discussed the slope-intercept form, it is stated here again for convenience.

**Slope-intercept form:** The slope-intercept form of an equation with slope \( m \) and \( y \)-intercept \( b \) is given by
\[
y = mx + b.
\]

**Point-slope formula:** The equation of the line with slope \( m \) and passing through \((x_1, y_1)\) can be found using
\[
y - y_1 = m(x - x_1).
\]

**Example 1:** Find the equation of the line with slope \( m = \frac{2}{3} \) and which passes through \( (4, -1) \).
Example 2: Find the equation of the line passing through (9, −2) and (1, 4).

- **Parallel lines**: Parallel lines are two lines in the same plane that never intersect.
- **Perpendicular Lines**: Two lines are perpendicular lines if they intersect to form a 90° angle.

<table>
<thead>
<tr>
<th>Parallel and Perpendicular Lines</th>
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<tbody>
<tr>
<td>- <strong>Parallel lines</strong> have the same slope. So, $m_1 = m_2$.</td>
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<tr>
<td>- <strong>Perpendicular lines</strong> have negative reciprocal slopes. In other words, $m_1 \cdot m_2 = -1$.</td>
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Example 3: Determine whether the following lines are parallel, perpendicular, or neither.

$$3x - 5y = 10 \quad \text{and} \quad 5x + 3y = 7$$

Example 4: Find the equation of the line that is parallel to $5x - 3y = 2$ and which passes through (1, 3).
Example 5: Find the equation of the line that is perpendicular to $3x + 2y = 1$ and which passes through $(4, -2)$.

Example 6: Given $P = \left(\frac{1}{2}, -7\right)$.

(a) Find the equation of the horizontal line passing through $P$.

(b) Find the equation of the vertical line passing through $P$.

Homework: pp 115–116; #1–67 every other odd (eo0)