🔷 Understanding the Equation of a Straight Line

A straight line can be written in several forms:

1. **Slope-intercept form:**

   $y = mx + c$

   where:

   - m is the **gradient (slope)** of the line
   - c is the **y-intercept** (the value of y when $x = 0$)

2. **General form:**

   $ax + by = c$

   This can be rearranged into the slope-intercept form if needed.

3. **Vertical lines:**

   $x = k$

   - This is a **vertical line** passing through $x = k$
   - The gradient is **undefined**

4. **Horizontal lines:**

   $y = k$

   - This is a **horizontal line** passing through $y = k$
   - The gradient is **0**

🔷 How to Find the Equation of a Line

📌 Example 1: Line through two points

Find the equation of the line passing through $(2, 3)$ and $(4, 7)$

Step 1: Find the gradient (m):

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{4 - 2} = \frac{4}{2} = 2$$

Step 2: Use point-slope form:

$$y - y_1 = m(x - x_1)$$

Using point $(2, 3)$:

$$y - 3 = 2(x - 2) \Rightarrow y = 2x - 1$$

🔷 Finding Gradient and Intercept from an Equation

📌 Example 2:

Find the gradient and y-intercept of the line:

$$5x + 4y = 8$$

Step 1: Rearrange to $y = mx + c$:

$$4y = -5x + 8 \Rightarrow y = -\frac{5}{4}x + 2$$

- Gradient $m = -\frac{5}{4}$
- Y-intercept $c = 2$

🔷 Vertical and Horizontal Line Examples

📌 Example 3:

- $x = 3$: vertical line through $x = 3$, **no y-intercept**, **undefined slope**
- $y = -2$: horizontal line, gradient = 0, y-intercept = -2

🔷 Important Tips

- Always **simplify your final equation**
- Rearrange equations into $y = mx + c$ to **easily find gradient and intercept**
- Use **clear algebra** when rearranging or solving