The Family of Lines: One Form, Many Members

A family of graphs shares one form and differs only in its numbers. All lines are y = mx + b: one family, each line a member, m and b the parameters. b slides the line, m tilts it.

1 THE VOCABULARY
Words we use

Family of graphs a group of graphs with the same form, differing only in their numbers.

Member one graph in the family, picked out by its own numbers.

Parameter a number like m or b that picks out one member.

Change b the line slides up or down without tilting. Same m, so parallel.

Change m the line tilts around (0, b): bigger is steeper, 0 is flat, negative falls.

Parallel same slope, never meet. Unit 4 goes further.

- Watch out for these.
- Thinking a change in b tilts the line. It slides. Only m tilts.
- Thinking two lines with the same b are parallel. Same b means same starting point; parallel means same m.
- Calling y = 2x + 3 and y = 2x + 3 parallel. Same m and same b is the same line.
- Forgetting the special members: m = 0 is the flat line y = b, and b = 0 goes through the origin.

2 THE METHOD
The habit for every family

1. **NAME THE FAMILY** same form, different numbers. Straight lines: y = mx + b.
2. **FIND ITS NUMBERS** the parameters. For a line: m (the number on x) and b (the number standing alone).
3. **SAY WHAT EACH NUMBER DOES** b slides the line up or down (its starting height on the y-axis). m tilts it around that point (steepness and direction).
4. **MATCH BY ELIMINATION** equation versus several graphs: sign of m first (falls, climbs, flat), then b (where it crosses the y-axis), then the size of m (steep or gentle). Cross out, do not plug in.
5. **USE IT** same m: parallel. Same b: same starting point, different tilt. Later families: ask the same three questions.

WHY LINES ARE WHERE THE HABIT STARTS
Lines are the simplest family: two numbers, two jobs, and you can see both on the graph at once. The exponential family (curves that multiply) and the quadratic family (U shapes) come later, each with its own form and its own numbers that move it around.

3 SAME FAMILY, DIFFERENT MEMBERS
Four members compared with y = 2x + 1

y = 2x + 1	the starting member: m = 2 (up 2 per step), b = 1 (crosses the y-axis at (0, 1))
y = 2x + 4	same m, b up by 3: the same line slid up 3. Parallel
y = 2x − 2	same m, b down by 3: slid down 3. Parallel to both
y = −12x + 1	same b, new m: still crosses at (0, 1), but tilted to fall gently
y = 1	same b, m = 0: the flat member through (0, 1)

CHECK ON THE GRID
Plot (0, b) for each one and step by its m. The three with m = 2 make a set of evenly spaced parallel lines. The two with b = 1 cross at (0, 1) and fan out.

SAY IT OUT LOUD
Name the family. Find its numbers. b slides, m tilts. Lines add, exponentials multiply, quadratics bend.