

Graphical Solutions

Quick revision notes [Open it online](#)

Name: _____

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At a glance

Solving equations with graphs, finding the line to draw, simultaneous equations and gradients from tangents.

1. Solving equations from a graph
2. Finding the line to draw
3. Simultaneous equations on a graph
4. Gradient of a curve

1. Solving equations from a graph

☐ I revised this

- Solutions of $f(x) = 0$ are the x values where the curve crosses the **x-axis**.
- Solutions of $f(x) = k$: draw the horizontal line $y = k$ and read the x values where it meets the curve.
- The number of crossing points is the number of solutions.

Worked example

The graph of $y = x^2 - x - 6$ is drawn. Solve $x^2 - x - 6 = 4$.

1. Draw $y = 4$.
2. Read the x values where the line meets the curve.

about $x = -2.7$ and $x = 3.7$

2. Finding the line to draw

☐ I revised this

- You have the graph of one curve and must solve a different equation.
- Rearrange the new equation so one side is **exactly** the curve you have; the other side is the line to draw.

How to do it

1. Write the curve's expression (e.g. $x^2 - 3x$).
2. Rearrange the new equation to: that expression = something.
3. Draw $y = \text{something}$.
4. Read the x values of the crossing points.

Worked example

The graph of $y = x^2 - 3x$ is drawn. What line should you draw to solve $x^2 - 5x + 2 = 0$?

1. Add $2x - 2$ to both sides: $x^2 - 3x = 2x - 2$.

Draw $y = 2x - 2$

Exam tip: Check by subtracting: $x^2 - 3x - (2x - 2)$ should give back $x^2 - 5x + 2$.

3. Simultaneous equations on a graph

☐ I revised this

- The solution is the point where the two graphs cross: read both x and y .
- A line and a curve can cross 0, 1 or 2 times (a cubic up to 3).

Worked example

Where do $y = 2x + 1$ and $y = 7 - x$ meet?

1. $2x + 1 = 7 - x \rightarrow x = 2$.

2. $y = 2(2) + 1 = 5$.

(2, 5)

4. Gradient of a curve

☐ I revised this

- Draw a **tangent** at the point: a straight line that touches the curve there without cutting it.
- Pick two points far apart on the tangent; gradient = rise $\div$ run.
- On a distance–time graph the gradient is speed; on a speed–time graph it is acceleration.

How to do it

1. Draw the tangent with a ruler.
2. Choose two points on it, far apart.
3. Gradient = change in $y \div$ change in x .

Worked example

A tangent passes through (1, 3) and (4, 12). Find its gradient.

1. Rise = $12 - 3 = 9$.

2. Run = $4 - 1 = 3$.

Gradient 3

Common mistakes

Don't write	Write instead
 Reading y values when x values are asked	 Solutions of an equation in x are x values
 Drawing $y = x - 3$ for $x^2 + x - 3 = 0$ with $y = x^2 + 2x$	 Add the same to both sides: $y = x + 3$
 Using two points on the curve for a gradient	 Use two points on the tangent
 A tangent that cuts through the curve	 It must touch at one point only

In the exam

- Draw lines long enough to meet the curve everywhere it can.
- State the equation of any line you draw.
- Gradient estimates are given a range of accepted answers — draw carefully and read accurately.

My notes