2.3 Lines, curves and inequalities

Name: _____ Class: _____ Date: _____ **Total: 25 marks**

KEY WORDS completing the square

Lines, curves and inequalities

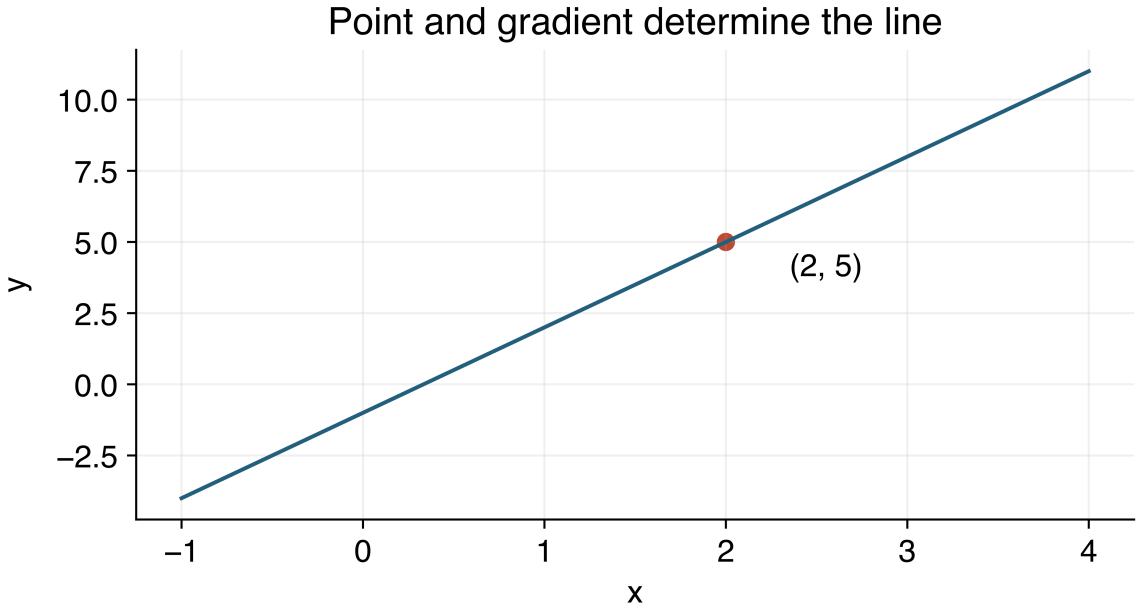
Objective

Find line equations through two points or a point with a gradient; use perpendicular gradients; sketch curve families; solve linear and quadratic inequalities (rows A10–A12, A16, A23 with the Extension additions; several lines unsampled).

1 Key knowledge and worked examples

Lines. $m = \frac{y_2 - y_1}{x_2 - x_1}$; through a point: $y - y_1 = m(x - x_1)$. Through $(1, 7)$ and $(2, 9)$: $m = 2$, $y = 2x + 5$. Perpendicular gradients (not sampled): $m_1 m_2 = -1$.

Curves and inequalities. Sketch linear, quadratic, cubic, reciprocal graphs; exponential $y = k^x$ and trig graphs (not sampled). Turning points by completing the square: $x^2 - 6x + 5 = (x - 3)^2 - 4$, minimum $(3, -4)$ (not sampled). Quadratic inequality: $x^2 - x - 6 > 0 \Rightarrow x < -2$ or $x > 3$.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 Find the equation of the line through $(1, 7)$ and $(2, 9)$ [3]

2.2 Find the equation of the line through $(0, -3)$ with gradient 4 [2]

2.3 Write down the gradient perpendicular to $m = \frac{2}{5}$ [1]

2.4 Solve $x^2 - x - 6 > 0$ [3]

2.5 Solve $-7 \leq 3x + 2 < 6$ (the 2E specimen's answer family) [3]

3 Exam-style questions

3.1 *(Original.)* A line joins $A(-1, 3)$ to $B(3, 11)$. (a) Find its equation. (b) Find the equation of the perpendicular line through the midpoint of AB. [5]

3.2 *(Original, specification line not sampled: completing the square.)* Write $x^2 + 6x + 2$ in the form $(x + a)^2 + b$, hence state the minimum point and solve $x^2 + 6x + 2 = 0$ giving exact roots (the 1E specimen's answer family). [5]

3.3 *(Original.)* Sketch or describe the graph of $y = 2^x$, giving the y-intercept and the behaviour as x grows and as $x \to -\infty$. [3]