Tangent and normal lines

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Find the tangent to $y = x^2$ at $x = 1$. [3 marks]

Point $(1, 1)$, gradient 2; $y - 1 = 2(x - 1)$.

Answer: $y = 2x - 1$

2. Find the normal to $y = x^2$ at $x = 1$. [3 marks]

Tangent gradient 2 gives normal gradient $-\frac{1}{2}$.

$y - 1 = -\frac{1}{2}(x - 1)$.

Answer: $y = -\frac{1}{2}x + \frac{3}{2}$

3. Find the tangent to $y = x^3$ at $x = 2$. [3 marks]

Point $(2, 8)$; gradient $3(2)^2 = 12$.

$y - 8 = 12(x - 2)$.

Answer: $y = 12x - 16$

4. Find the normal to $y = 3x^2$ at $x = -1$. [3 marks]

Point $(-1, 3)$; tangent gradient -6; normal gradient $\frac{1}{6}$.

Answer: $y - 3 = \frac{1}{6}(x + 1)$

5. Find tangent and normal to $y = x^2$ at the origin. [3 marks]

The derivative is 0, giving a horizontal tangent and vertical normal.

Answer: $y = 0$ and $x = 0$

6. Can $(1, 4)$ be a point of tangency on $y = x^2 + 1$? Explain. [3 marks]

$1^2 + 1 = 2$, so $(1, 4)$ is not on the curve.

Answer: No. The curve has $y = 2$ at $x = 1$.