TANGENTS AND NORMALS TO A CURVE

1 Find the equations of the tangent and normal to the curve $y = x^2$ at $(2, 4)$.

2 Find the equations of the tangent and normal to the curve $y = 3x - x^2$ at $(0, 0)$.

5 Find the equations of the tangent and normal to the curve $y = 2x^2 - 4x + 1$ where the gradient is 4.

6 Find the equations of the tangent and normal to the curve $y = \frac{1}{x}$ at the point where $x = -2$. Indicate whether each statement below is a correct or incorrect step in answering this question.

(a) $\frac{dy}{dx} = \frac{1}{x^2}$

(b) At $\left(-2, -\frac{1}{2}\right)$, $\frac{dy}{dx} = -\frac{1}{4}$

(c) Equation of tangent is $x + 4y + 4 = 0$

(d) Equation of normal is $8x - 2y + 15 = 0$

8 Find the equations of the tangent and normal to the curve $y = 3x^3 - 7x^2 + 2x$ at the point where $x = 2$.

9 The straight line $y = x + 2$ cuts the parabola $y = \frac{x^2}{2} - 2$ at two points P and Q. Find the coordinates of P and Q. Also find the equations of the tangents to the parabola at P and Q and the coordinates of the point of intersection of these tangents.

11 Find the equations of the tangent and normal to the parabola $y = 2x^2 - 4x + 1$ at the point of zero gradient.

13 The line $y = x + 4$ cuts the parabola $y = x^2 - 2x$ at two points A and B. Find the size of the angles that the tangents to the curve at A and B make with the x-axis.

18 The line $y = x - 2$ cuts the curve $y = x^3(x - 2)$ at two points A and B. Calculate the angles that the tangents to the curve at A and B make with the x-axis and hence find the angle between the tangents.

20 Find the coordinates of the points on the curve $y = x^2(2x - 3)$ at which the tangent is parallel to:

(a) the line $y = 12x - 1$ **(b)** the x-axis.