Stationary Points

(a) Find the gradient of the curve $y = x^2 - 3x + 7$ at the point $(3, 7)$

(b) Find the gradient of the curve $y = x^3 + 4x^2 - 9x$ at the point $(2, 6)$

(c) Find the gradient of the curve $y = x + \frac{9}{x}$ at the point $(3, 6)$

(a) $\frac{dy}{dx} = 2x - 3$ $\frac{dy}{dx} = 3$

(b) $\frac{dy}{dx} = 3x^2 + 8x - 9$

$\frac{dy}{dx} = 19$

(c) $\frac{dy}{dx} = 1 - \frac{9}{x^2}$ $\frac{dy}{dx} = 0$

(a) Find the coordinates of the minimum point on the curve $y = x^2 - 4$

(b) Find the coordinates of the minimum point on the curve $y = x^2 + 8x + 15$

(c) Find the coordinates of the maximum point on the curve $y = 7 - 6x - x^2$

(d) Find the coordinates of the maximum point on the curve $y = 2 + 5x - x^2$

(a) $\frac{dy}{dx} = 2x$ $(0, -4)$

(b) $\frac{dy}{dx} = 2x + 8$ $(-4, -1)$

(c) $\frac{dy}{dx} = -6 - 2x$ $(-3, 16)$

(d) $\frac{dy}{dx} = 5 - 2x$ $\left(\frac{5}{2}, \frac{33}{4}\right)$

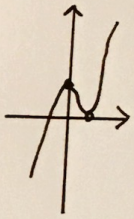
(a) Find the coordinates of the stationary points on the curve $y = x^3 - 3x^2 + 4$. By sketching the graph, determine whether each point is a minimum point or a maximum point.

(b) Find the coordinates of the stationary point on the curve $y = 3x + \frac{12}{x^2}$. Is this point a minimum point or a maximum point?

(a) $\frac{dy}{dx} = 3x^2 - 6x$

$x = 0, x = 2$

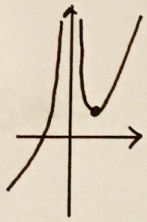
$(0, 4)$ MAX $(2, 0)$ MIN



(b) $\frac{dy}{dx} = 3 - \frac{24}{x^3}$

$3 = \frac{24}{x^3} \Rightarrow x = 2$ $(2, 9)$

MINIMUM



(a) The curve with equation $y = x^2 + ax + b$ has a stationary point at $(-4, -11)$. Find the values of a and b.

(b) The curve with equation $y = c + dx - x^2$ has a stationary point at $(3, 10)$. Find the values of c and d.

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

$0 = 2 \times -4 + a$

$a = 8$,

$-11 = (-4)^2 + 8(-4) + b \Rightarrow b = 5$

(b) $\frac{dy}{dx} = d - 2x$

$0 = d - 6$ $d = 6$

$10 = c + 6(3) - (3)^2$ $c = 1$