Differentiation Revision

(a)

$y = 4x^2 + 5x - 7$

Find $\frac{dy}{dx}$

$\frac{dy}{dx} = 8x + 5$

(b)

$y = (2x - 3)(x + 5)$

Find $\frac{dy}{dx}$

$\frac{dy}{dx} = 4x + 7$

(c)

Find $\frac{dy}{dx}$ when $y = \frac{x^5 - 3x^2}{x^2}$

$\frac{dy}{dx} = 3x^2$

(d)

Find $\frac{dy}{dx}$ when $y = 15x^2 + \frac{2}{x}$

$\frac{dy}{dx} = 30x - \frac{2}{x^2}$

(e)

$y = x^2(3 - x)$

Find the value of $\frac{dy}{dx}$ when $x = -4$

$\frac{dy}{dx} = -72$

(f)

The gradient of the curve $y = 4x^2 - kx$ at the point where $x = -2$ is -6. Find the value of k.

$k = -10$

(g)

Find the coordinates of the minimum point of the curve $y = x^2 - 5x + 1$

$\left(\frac{5}{2}, -\frac{21}{4}\right)$

(h)

The distance of a particle is given by $s = t^3 - 5t^2 + 3t$. Find the velocity and acceleration at time $t = 4$ seconds

$v = 31\ ms^{-1}$

$a = 14\ ms^{-2}$

(i)

A curve with equation $y = \frac{1}{3}x^3 - 3x^2 + 5x$ has two turning points. Work out the coordinates of the turning points.

$\frac{dy}{dx} = x^2 - 6x + 5$

$\left(5, -\frac{25}{3}\right)$ and $\left(1, \frac{7}{3}\right)$

(j)

Find the range of values for which the gradient of the curve $y = x^3 - 5x^2 + 3x - 2$ is negative

$\frac{dy}{dx} = 3x^2 - 10x + 3$

$\frac{1}{3} < x < 3$

(k)

A rectangle has a perimeter of 120 cm. Given that the length of the rectangle is x, show that the area $A = 60x - x^2$

Hence find the length x that gives the maximum area of the rectangle.

Let width $= y$ then $y = \frac{120 - 2x}{2} = 60 - x$

$A = x(60 - x) = 60x - x^2$

Maximum area when $x = 30$