4. It is given that $y=\frac{x^2}{2}(3-2x)^5$.

(i) Obtain an expression for $\frac{dy}{dx}$. **[2]**

(ii) Determine the set of values of x for which y is increasing. **[2]**

(iii) A point P moves along the curve $y = \frac{x^2}{2}(3-2x)^5$ in such a way that the y-coordinate of P is decreasing at a rate of 0.05 units per second
Find the rate of increase of the x-coordinate of P when $x = 1$. **[2]**

4. It is given that $y = \dfrac{x^2}{2}(3-2x)^5$.

(i) Obtain an expression for $\dfrac{dy}{dx}$. **[2]**

Product Rule

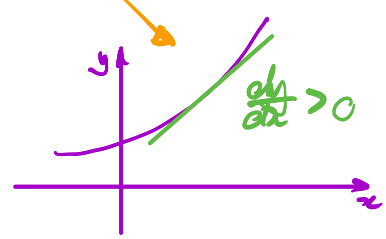
$$\frac{dy}{dx} = \frac{x^2}{2}\left[5(3-2x)^4(-2)\right] + (3-2x)^5(x)$$

$$= -5x^2(3-2x)^4 + x(3-2x)^5$$

$$= (3-2x)^4(3x-7x^2)$$

(ii) Determine the set of values of x for which y is increasing. **[2]**

For y to be increasing, $\dfrac{dy}{dx} > 0$



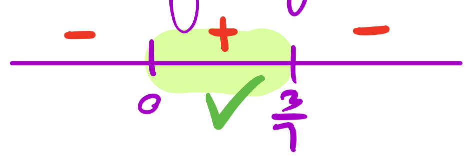
$(3-2x)^4(3x-7x^2) > 0$

always +'ve

$3x - 7x^2 > 0$

$x(3-7x) > 0$

Testing Regions,



$\therefore 0 < x < \dfrac{3}{7}$

Ans

(iii) A point P moves along the curve $y = \frac{x^2}{2}(3-2x)^5$ in such a way that the y-coordinate of P is decreasing at a rate of 0.05 units per second
Find the rate of increase of the x-coordinate of P when $x = 1$. **[2]**

By Chain Rule,

$$\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt}$$

$$\frac{dy}{dt} = (3-2x)^4(3x-7x^2) \times \frac{dx}{dt}$$

Subst. $x = 1$: $-0.05 = -4\frac{dx}{dt}$

$\therefore \frac{dx}{dt} = 0.0125$ units/s