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9 A curve is such that $\frac{dy}{dx} = \frac{9}{(1-2x)^4}$, $x \neq \frac{1}{2}$ and $(1, 5)$ is a point on the curve.

(i) Find the equation of the curve. [4]

$$y = \int 9(1-2x)^{-4}\,dx$$

$$\int \frac{1}{9(1-2x)^4}\,dx$$

$$= \int 9(1-2x)^{-4}\,dx$$

$$y = \frac{9(1-2x)^{-3}}{-3(-2)} + c$$

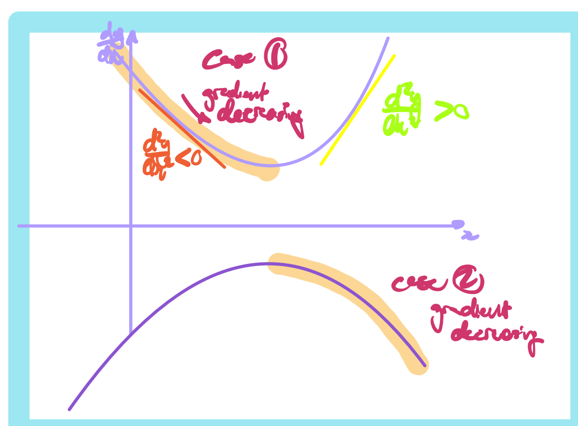
Sub $(1, 5)$, $c = \frac{13}{2}$

$$\therefore y = \frac{3}{2(1-2x)^3} + \frac{13}{2}$$

Ans

(ii) Find the range of values of x such that the gradient of the curve is decreasing. [3]

$$\frac{d^2y}{dx^2} = \frac{72}{(1-2x)^5}$$



gradient is decreasing $\Rightarrow \frac{d^2y}{dx^2} < 0$

Since $72 > 0$, $\Rightarrow (1-2x)^5 < 0$

$1 - 2x < 0$

$\therefore x > \frac{1}{2}$

Ans