$$y = \frac{5x+9}{2x-10}$$

diff. w.r.t. x.

$$\frac{dy}{dx} = \frac{(2x-10)(5) - \overset{(5x+9)}{\cancel{5x+9}}\ (2)}{(2x-10)^2}$$

$$= \frac{(10x-50) - (10x+18)}{(2x-10)^2}$$

$$= \frac{-68}{(2x-10)^2}$$

$$\therefore \frac{dx}{dy} = \frac{-(2x-10)^2}{68}$$

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2) $\frac{x+2}{x^2+1}$
3) $\frac{5x+9}{2x-10}$

diff. w.r.t. x.

$$\frac{dy}{dx} = 25 + \frac{2x}{1+x^2} = \frac{25x^2+2x+25}{1+x^2}$$

by derivative of the inverse function

$$\therefore \frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}, \quad \frac{dy}{dx} \neq 0$$

$\therefore$ Rate of change of demand with respect to price $= \frac{dx}{dy} = \frac{1+x^2}{25x^2+2x+25}$

2. Find the marginal demand (x) of a commodity with respect to its price (y) if.

1) $y = xe^{-x}+7$

$\rightarrow$ $y = xe^{-x}+7$

diff. w.r.t. x.

$$\frac{dy}{dx} = xe^{-x}(-1) + e^{-x}$$

$$= e^{-x}(1-x)$$

$$\therefore \frac{dx}{dy} = \frac{1}{e^{-x}(1-x)}$$

2) $\cancel{x}$ $y = \frac{x+2}{x^2+1}$

$\rightarrow$ diff. w.r.t. x.

$$\therefore \frac{dy}{dx} - \frac{(x^2+1) - (x+2)(2x)}{(x^2+1)^2}$$

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

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Exercise 3.2

1. Find the rate of change of demand (x) of a commodity with respect to its price (y)

1) $y = 12 + 10x + 25x^2$

→ Let $y = 12 + 10x + 25x^2$

diff. w.r.t. x.

$$\frac{dy}{dx} = 10 + 50x$$

by derivative of the inverse function

$$\therefore \frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}, \quad \frac{dy}{dx} \neq 0$$

∴ Rate of change of demand with respect to price $= \frac{dx}{dy} = \frac{1}{10 + 50x}$

2) $y = 18x + \log(x-4)$

→ Let $y = 18x + \log(x-4)$

diff. w.r.t. x.

$$\frac{dy}{dx} = 18 + \frac{1}{x-4} = \frac{18x - 72 + 1}{x-4} = \frac{18x - 71}{x-4}$$

by derivative of the inverse function

$$\therefore \frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}, \quad \frac{dy}{dx} \neq 0$$

∴ Rate of change of demand with respect to price $= \frac{dx}{dy} = \frac{x-4}{18x-71}$

3) $y = 25x + \log(1 + x^2)$

→ $y = 25x + \log(1 + x^2)$

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