5. $y = e^{x+y}$

$y' = e^{x+y}(1+y')$

$y' = e^{x+y} + y' e^{x+y}$

$y' - y' e^{x+y} = e^{x+y}$

$y'(1 - e^{x+y}) = e^{x+y}$

$y' = \dfrac{e^{x+y}}{1 - e^{x+y}}$

H.w. Find y' for the following:

1. $4x^2 + 3xy - xy^2 = 0$
2. $3x^2y^3 + 6xy - 5x^2 = 0$
3. $y^2 = \tan \dfrac{x}{y}$
4. $y = \dfrac{x^2}{xy}$
5. $y\sqrt{2+3x} + x\sqrt{1+y} = x$

Concept of derivatives and the fundemntal differetiation:-

Derivatives:-

The derivative of a function f is denoted by f' and defined by:-

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Ex Find the derivative of the function:-

1. $f(x) = x^2 + 2x$ by using the difinition:-

Solu

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x) = x^2 + 2x \quad ; \quad f(x+h) = (x+h)^2 + 2(x+h)$$

$$\therefore f'(x) = \lim_{h \to 0} \frac{(x+h)^2 + 2(x+h) - (x^2 + 2x)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{x^2} + 2xh + h^2 + \cancel{2x} + 2h - \cancel{x^2} - \cancel{2x}}{h}$$

$$= \lim_{h \to 0} \frac{2xh + h^2 + 2h}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(2x + h + 2)}{\cancel{h}}$$

$$= 2x + 2$$

2. $f(x) = \dfrac{1}{x}$

Solu

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x) = \frac{1}{x} \quad ; \quad f(x+h) = \frac{1}{x+h}$$

$$\therefore f'(x) = \lim_{h \to 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{x - x - h}{x(x+h)}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{-h}{x(x+h)}}{\frac{h}{1}}$$

$$= \lim_{h \to 0} \frac{-\cancel{h}}{x(x+h)} \cdot \frac{1}{\cancel{h}}$$

$$= \frac{-1}{x^2}$$

H.w.

1. $f(x) = 2x^2 + 4x$
2. $f(x) = x^2 + 1$
3. $f(x) = x^2 + 3$