Limits

$\left(\frac{0}{0}, \frac{\infty}{\infty}, \infty \right)$

I

- factor.
- formula.
- Identity

$\lim_{x \to 3} (x+3)$

$\Rightarrow 3+3 = \left(6 \text{ defined value}\right)$ Ans

$$\boxed{\lim_{x \to a} \frac{x^n - a^n}{x - a}} \Rightarrow \boxed{n a^{n-1}}$$

Ex. 13.1

Que1. Evaluate

$\lim_{x \to 3} (x+3) \Rightarrow 3+3 = \underline{6} \text{ Fixed}$ Ans.

Que2. $\lim_{x \to \pi} \left(x - \frac{22}{7} \right)$

$$\boxed{\pi \neq \frac{22}{7}, 3.14}$$

use when given

$\Rightarrow \left(\pi - \frac{22}{7} \right)$

Que6. $\lim_{x \to 0} \frac{(x+1)^5 - 1^5}{x}$

$$\lim_{x \to a} \frac{x^n - a^n}{x - a} = n a^{n-1}$$

$\Rightarrow \frac{(0+1)^5 - 1^5}{0} = \frac{1-1}{0} = \frac{0}{0}$ Indeterminate form

Put $\boxed{x+1 = t}$

$0+1 = t$

$\boxed{t \to 1}$

$$\lim_{t\to 1} \frac{t^5 - 1^5}{t-1}$$

$\Rightarrow 5(1)^{5-1} = 5(1)^4$

$= 5\times 1 = 5$

Que 7

$$\lim_{x\to 2} \frac{3x^2 - x - 10}{x^2 - 4} \longrightarrow \text{Factor}$$

$$\frac{3(2)^2 - 2 - 10}{(2)^2 - 4} = \frac{3\times 4 - 12}{4-4} = \frac{12-12}{4-4} = \frac{0}{0}$$

$$\lim_{x\to 2} \frac{3x^2 - 6x + 5x - 10}{(x-2)(x+2)} = \frac{3x(x-2) + 5(x-2)}{(x-2)(x+2)}$$

$$\lim_{x\to 2} \frac{(3x+5)\cancel{(x-2)}}{\cancel{(x-2)}(x+2)} = \frac{3\times 2 + 5}{2+2} = \frac{11}{4}$$

Que 8.

$$\lim_{x\to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$$

$$\frac{(x^2)^2 - (3^2)^2}{2x^2 - 6x + x - 3} \Rightarrow \frac{(x^2-9)(x^2+9)}{2x(}$$

Que10

$$\lim_{z\to 1} \frac{z^{1/3}-1}{z^{1/6}-1}$$

$$\boxed{\lim_{x\to a} \frac{x-a}{x^n-a^n} = \frac{1}{na^{n-1}}}$$

$$\lim_{z\to 1} \frac{z^{1/3}-1}{(z^{1/3})^{1/2}-(1)^{1/2}} = \frac{1}{\frac{1}{2}(1)^{1/2-1}}$$

$$\Rightarrow \frac{1}{\frac{1}{2}} = 2$$

Que12

$$\lim_{x\to 2} \frac{\frac{1}{x}+\frac{1}{2}}{x+2} = \lim_{x\to 2} \frac{\frac{\cancel{x+2}}{2x}}{\cancel{(x+2)}}$$

$$= \frac{1}{2x} = \frac{1}{2\times 2} = \frac{1}{4}$$