

Ex 1.5

- Q1
- (i) $x = 0$
 - (ii) $x = 3$
 - (iii) $x = -2$
 - (iv) $x = 2$
 - (v) $x = -3$
 - (vi) $x = -\frac{\pi}{2}, x = \frac{\pi}{2}$

Q2

- (i) $x = 0$
- (ii) $\lim_{x \rightarrow 0} \frac{2}{x} = \frac{2}{0} \Rightarrow$ Undefined.

- Q3
- (i) $x = 4$
 - (ii) $x = 5$ or $x = -5$
 - (iii) $x^2 - 3x - 4 \rightarrow (x - 4)(x + 1) \Rightarrow x = 4$ or $x = -1$

Q5

- (i) $\lim_{x \rightarrow 2} \frac{x+3}{x+2} = \frac{2+3}{2+2} = \frac{5}{4}$

- (ii) $\lim_{x \rightarrow 0} (x^2 + 3x - 4) = 0^2 + 3(0) - 4 = -4$

- (iii) $\lim_{x \rightarrow 3} \frac{x^2 - x - 3}{x + 1} = \frac{3^2 - 3 - 3}{3 + 1} = \frac{3}{4}$

Q7 (i) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} \Rightarrow \frac{1^2 - 1}{1 - 1} = \frac{0}{0}$ Indeterminate.

$$\lim_{x \rightarrow 1} \frac{(x+1)(\cancel{x-1})}{(\cancel{x-1})} = \lim_{x \rightarrow 1} x+1 = 1+1 = 2.$$

(ii) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2} = \lim_{x \rightarrow 2} \frac{(x+2)(\cancel{x-2})}{\cancel{x-2}} = \lim_{x \rightarrow 2} x+2 = 2+2 = 4$

(iii) $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5} = \lim_{x \rightarrow 5} \frac{(x+5)(\cancel{x-5})}{(\cancel{x-5})} = \lim_{x \rightarrow 5} x+5 = 5+5 = 10$

(iv) $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x - 1} = \lim_{x \rightarrow 1} \frac{(x-2)(\cancel{x-1})}{(\cancel{x-1})} = \lim_{x \rightarrow 1} x-2 = 1-2 = -1$

(v) $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x - 1} = \lim_{x \rightarrow 1} \frac{(x+2)(\cancel{x-1})}{(\cancel{x-1})} = \lim_{x \rightarrow 1} x+2 = 1+2 = 3$

(vi) $\lim_{x \rightarrow -3} \frac{x+3}{x^2 - x - 12} = \lim_{x \rightarrow -3} \frac{1}{(x-4)(\cancel{x+3})} = \lim_{x \rightarrow -3} \frac{1}{x-4} = \frac{1}{-3-4} = -\frac{1}{7}$

Q8 $f(x) = \frac{x^2 - 9}{x - 3}$ Limit as $x \rightarrow 3$.

x	2.5	2.9	2.999	2.9999	3	3.001	3.1	3.5
$f(x)$	5.5	5.9	5.999	5.9999	undefined	6.001	6.1	6.5

\Rightarrow limit at $x = 6$

$$\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3} = \lim_{x \rightarrow 3} \frac{(x+3)(\cancel{x-3})}{\cancel{x-3}} = \lim_{x \rightarrow 3} x+3 = 3+3 = 6$$

$$\text{Q9 (i) } \lim_{x \rightarrow \infty} f(x) = \frac{1}{x} \quad \lim_{x \rightarrow \infty} \frac{1}{x} = 0$$

$$\text{(ii) } \lim_{x \rightarrow \infty} f(x) = \frac{4}{3x} \quad \lim_{x \rightarrow \infty} \frac{4}{3x} = 0$$

$$\text{(iii) } \lim_{x \rightarrow \infty} f(x) = \frac{1}{x^2} \quad \lim_{x \rightarrow \infty} \frac{1}{x^2} = 0$$

$$\text{(iv) } \lim_{x \rightarrow \infty} f(x) = \frac{4}{x^3} \quad \lim_{x \rightarrow \infty} \frac{4}{x^3} = 0$$

$$\text{Q10 (i) } \lim_{x \rightarrow \infty} \frac{3x-2}{2x+3} = \lim_{x \rightarrow \infty} \frac{3 - \frac{2}{x}}{2 + \frac{3}{x}} = \frac{3-0}{2+0} = \frac{3}{2}$$

$$\text{(ii) } \lim_{x \rightarrow \infty} \frac{4x-3}{7x-6} = \lim_{x \rightarrow \infty} \frac{4 - \frac{3}{x}}{7 - \frac{6}{x}} = \frac{4-0}{7-0} = \frac{4}{7}$$

$$\text{(iii) } \lim_{x \rightarrow \infty} \frac{1-3x}{4x+2} = \lim_{x \rightarrow \infty} \frac{\frac{1}{x} - 3}{4 + \frac{2}{x}} = \frac{0-3}{4+0} = \frac{-3}{4}$$

$$\text{Q11 (i)} \quad \lim_{n \rightarrow \infty} \frac{n^2+4}{3n^2-4n} \Rightarrow \div n^2$$

$$= \lim_{n \rightarrow \infty} \frac{1 + \frac{4}{n^2}}{3 - \frac{4}{n}} = \frac{1+0}{3-0} = \frac{1}{3}$$

$$\text{(ii)} \quad \lim_{n \rightarrow \infty} \frac{5n^2-3}{2n^2-6n+5} \div n^2$$

$$= \lim_{n \rightarrow \infty} \frac{5 - \frac{3}{n^2}}{2 - \frac{6}{n} + \frac{5}{n^2}} = \frac{5-0}{2-0+0} = \frac{5}{2}$$

$$\text{(iii)} \quad \lim_{n \rightarrow \infty} \frac{2n^2-3n+2}{6n^2+5n-6} \div n^2$$

$$\lim_{n \rightarrow \infty} \frac{2 - \frac{3}{n} + \frac{2}{n^2}}{6 + \frac{5}{n} - \frac{6}{n^2}} = \frac{2-0+0}{6+0-0} = \frac{2}{6} = \frac{1}{3}$$

$$\text{Q13} \quad \lim_{x \rightarrow 3} \frac{x-3}{x^3-27}$$

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

$$= \frac{1}{3^2+3(3)+9} = \frac{1}{27}$$