Unit - 5. Limit - 12 Marks

* $f(x) = \dfrac{x^2+2}{x-2}$

$f(0) = -1$, $f(-1) = -1$, $f(1) = 3$, $f(2) = \infty$

* $\lim_{x \to 2} \dfrac{x^2+2}{x-2}$ $\quad x \to 2$, $x \neq 2$ $\quad x-2 \neq 0$.

* $\lim_{x \to a} \dfrac{x^2+a}{x-a}$ $\quad x \to a$, $x \neq a$ $\quad x-a \neq 0$

* $\lim_{x \to 1} (x^3 - 3x^2 + 5x - 6)$ (-3)

* $\lim_{x \to 0} \dfrac{x^2+3x+2}{5x+2}$ (1)

* $\lim_{x \to 1} \dfrac{x^2-4x+3}{x+1}$ (0)

* $\lim_{x \to -2} \dfrac{x^3+2x^2-x-1}{x-2}$ $\left(-\frac{1}{4}\right)$

* $\lim_{x \to 1} \dfrac{x^2+x+1}{x+1}$ $\left(\frac{3}{2}\right)$

* $\lim_{x \to 2} \dfrac{x^2-5x+6}{x-2}$ (-1)

* $\lim_{x \to 1} \dfrac{x^3-x^2+x-1}{x^2-1}$ (1)

* $\lim_{x \to 1} \dfrac{x^2-4x+3}{x^2+2x-3}$ $(-1/2)$

* $\lim_{x \to 3} \dfrac{x^2-x-6}{x^3-3x^2+x-3}$ $(1/2)$

* $\lim_{x \to 2} \dfrac{x^2-5x+6}{x^2-4}$ $\left(-\frac{1}{4}\right)$

* $\lim_{x \to 2} \dfrac{x^3-x^2-5x+6}{x^2-5x+6}$ (-3)

* $\lim_{x \to 1} \dfrac{x^2-6x+5}{2x^2-5x+3}$ (4)

* $\lim_{x \to 2} \dfrac{x^3-3x^2+5x-6}{x^3-8}$ $\left(\frac{5}{12}\right)$

* $\lim_{x \to 1} \dfrac{x^2-8x+7}{7x^2-6x-1}$ $\left(-\frac{3}{4}\right)$

* $\lim_{x \to 2} \dfrac{x^3-x^2-5x+6}{x^3-8}$ $\left(\frac{1}{4}\right)$

* $\lim_{x \to -3} \dfrac{x^3+27}{x^2+5x+6}$ (-27)

* $\lim_{x \to -1} \dfrac{2x^3+5x^2+4x+1}{3x^3+5x^2+x-1}$ $\left(\frac{1}{4}\right)$

* $\lim_{x\to 0} \frac{\sqrt{9+x}-3}{x}$ $\left(\frac{1}{6}\right)$

* $\lim_{x\to 0} \frac{\sqrt{1-x}-\sqrt{1+x}}{x}$ (-1)

* $\lim_{x\to 0} \frac{\sqrt{9-x}-3}{x}$ $(-1/6)$

* $\lim_{x\to a} \frac{\sqrt{2a-x}-\sqrt{x}}{a-x}$ $\left(\frac{1}{\sqrt{a}}\right)$

* $\lim_{x\to 0} \frac{\sqrt{25+x}-5}{x}$ $(1/10)$

* $\lim_{n\to\infty} \frac{1}{n} = 0$

* $\lim_{n\to\infty} \frac{6n^2-3n+5}{2n^2+4n-3}$ (3)

* $\lim_{n\to\infty} \frac{3n^3-4n^2-n-5}{2n^3+3n^2-2n+7}$ $\left(\frac{3}{2}\right)$

* $\lim_{x\to\infty} \frac{5x^2-3x+2}{6x^2+3x-1}$ $\left(\frac{5}{6}\right)$

* $\lim_{n\to\infty} \frac{4n^3-7n^2+5n-1}{8n^3+7n^2-4n+1}$ $\left(\frac{1}{2}\right)$

* $\lim_{x\to\infty} \frac{x(x+1)}{x^2+5x+6}$ (1)

* $\lim_{x\to\infty} \frac{x^2+8x+2}{x^3+x-4}$ (0)

* $\lim_{x\to\infty} \sqrt{x^2+x}-x$ $\left(\frac{1}{2}\right)$

* $\lim_{x\to\infty} \sqrt{x}\left(\sqrt{x+p}-\sqrt{x}\right)$ $\left(\frac{p}{2}\right)$

* $\lim_{n\to\infty} \sqrt{n^2+n+1}-n$ $\left(\frac{1}{2}\right)$

* $\sum n = 1+2+3+\dots+n = \frac{n(n+1)}{2}$

* $\sum n^2 = 1^2+2^2+3^2+\dots+n^2 = \frac{n(n+1)(2n+1)}{6}$

* $\sum n^3 = 1^3+2^3+3^3+\dots+n^3 = \frac{n^2(n+1)^2}{4}$

* $\lim_{n\to\infty} \frac{\sum n^2}{n^3}$ $\left(\frac{1}{3}\right)$

* $\lim_{n\to\infty} \frac{1^2+2^2+3^2+\dots+n^2}{n^3+1}$

* $\lim_{h\to 0} \frac{a^h - 1}{h} = \log_e a$ $\lim_{h\to 0} \frac{e^h - 1}{h} = \log_e e = 1$

* $\lim_{n\to\infty} \left(1+\frac{1}{n}\right)^n = e$ $\lim_{x\to 0} (1+x)^{1/x} = e$

* $\lim_{x\to 0} \frac{5^x - 1}{x} = \log_e 5$ * $\lim_{x\to 0} \frac{5^{2x} - 1}{x} = 2\log_e 5$

* $\lim_{x\to 0} \frac{3^x - 1}{x} = \log_e 3$ * $\lim_{x\to 0} \frac{3^{2x} - 1}{x} = 2\log_e 3$

* $\lim_{x\to 0} \frac{7^x - 1}{x} = \log_e 7$ * $\lim_{x\to 0} \frac{2^{3x} - 1}{x} = \log_e 8$

* $\lim_{x\to 0} \frac{3^x - 2^x}{x} = \log \frac{3}{2}$ * $\lim_{x\to 0} \frac{e^{3x} - 1}{x} = 3$

* $\lim_{x\to 0} \frac{5^x - 3^x}{x} = \log \frac{5}{3}$ * $\lim_{x\to 0} \frac{3^{2x} - 2^{3x}}{x} = \log \frac{9}{8}$

* $\lim_{x\to 0} \frac{a^x - b^x}{x} = \log \frac{a}{b}$ * $\lim_{x\to 0} \frac{e^{ax} - e^{bx}}{x} = (a-b)$

* $\lim_{x\to 0} \frac{8^x - 4^x - 2^x + 1}{x^2}$ $(\log_e 2 . \log_e 4)$ * $\lim_{x\to 0} \frac{2(3^x) + 3(2^x) - 5}{x}$

$2\log_e 3 + 3\log_e 2$ $\log_e 72$

* $\lim_{x\to 0} \frac{15^x - 5^x - 3^x + 1}{x^2}$ $(\log_e 3 . \log_e 5)$ * $\lim_{x\to\infty} x \cdot \left(\sqrt[x]{5} - 1\right)$ $(\log_e 5)$

* $\lim_{x\to\infty} \frac{a^{1/x} - 1}{1/x} = \log_e a$

* $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{n} = e$

* $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{4n}$ (e^{4})

* $\lim_{x\to\infty}\left(1+\frac{2}{x}\right)^{2x}$ (e^{4})

* $\lim_{x\to\infty}\left(1+\frac{5}{x}\right)^{2x}$ (e^{10})

* $\lim_{x\to\infty}\left(\frac{x+1}{x+2}\right)^{x}$ $\left(\frac{1}{e}\right)$

$\lim_{x\to 0}(1+x)^{1/x} = e$

* $\lim_{x\to 0}\left(1+\frac{2x}{3}\right)^{5/x}$ $(e^{10/3})$

* $\lim_{x\to 0}\left(1+\frac{3x}{4}\right)^{5/x}$ $(e^{15/4})$

* $\lim_{x\to 0}\left(1+\frac{5x}{7}\right)^{2/x}$ $(e^{10/7})$

* $\lim_{x\to 0}\left(1+\frac{3x}{2}\right)^{4/x}$ (e^{6})

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

* $\lim_{x\to 2}\frac{x^3-8}{x-2}$ (12)

* $\lim_{x\to 2}\frac{x^4-16}{x^3-8}$ $\left(\frac{8}{3}\right)$

* $\lim_{x\to 5}\frac{x^3-125}{x^2-25}$ $\left(\frac{15}{2}\right)$

* $\lim_{x\to a}\frac{\sqrt{x}-\sqrt{a}}{x-a}$ $\left(\frac{1}{2\sqrt{a}}\right)$

* $\lim_{x\to 3}\frac{x^3-27}{\sqrt[3]{x}-\sqrt[3]{3}}$ $(81\cdot 3^{2/3})$

* $\lim_{x\to 2}\frac{x\sqrt{x}-2\sqrt{2}}{x-2}$ $\left(\frac{3}{\sqrt{2}}\right)$

* $\lim_{x\to -1}\frac{x^{2021}+1}{x^{2022}+1}$

* $\lim\limits_{\theta \to 0} \dfrac{\sin\theta}{\theta} = 1$

* $\lim\limits_{\theta \to 0} \dfrac{\tan\theta}{\theta} = 1$

* $\lim\limits_{x \to 0} \dfrac{\sin^{-1}x}{x} = 1$

* $\lim\limits_{x \to 0} \dfrac{\tan^{-1}x}{x} = 1$

* $\lim\limits_{\theta \to 0} \dfrac{\sin 5\theta}{\theta}$ (5)

* $\lim\limits_{x \to 0} \dfrac{x}{\sin x}$ (1)

* $\lim\limits_{\theta \to 0} \dfrac{\sin m\theta}{\sin n\theta}$ $\left(\dfrac{m}{n}\right)$

* $\lim\limits_{x \to 0} \dfrac{\sin 3x}{x}$ (3)

* $\lim\limits_{x \to 0} \dfrac{\sin 3x}{2x}$ $\left(\dfrac{3}{2}\right)$

* $\lim\limits_{x \to 0} \dfrac{\tan 5x}{\sin 3x}$ $\left(\dfrac{5}{3}\right)$

* $\lim\limits_{\theta \to 0} \dfrac{\theta}{\tan 3\theta}$ $\left(\dfrac{1}{3}\right)$

* $\lim\limits_{\theta \to 0} \dfrac{\sin 2\theta}{\tan 3\theta}$ $\left(\dfrac{2}{3}\right)$

* $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{1-\sin x}{\cos^2 x}$ $\left(\dfrac{1}{2}\right)$

* $\lim\limits_{x \to 0} \dfrac{3\sin x - \sin 3x}{x^3}$ (4)

* $\lim\limits_{x \to 0} \dfrac{1-\cos x}{x^2}$ $\left(\dfrac{1}{2}\right)$

* $\lim\limits_{x \to 0} \dfrac{x^2}{1-\cos x}$ (2)

* $\lim\limits_{x \to 0} \dfrac{(1-\cos x)\sin x}{x^3}$ $\left(\dfrac{1}{2}\right)$

* $\lim\limits_{x \to 0} \dfrac{(1-\cos x)\tan x}{x^3}$ $\left(\dfrac{1}{2}\right)$

* $\lim\limits_{x \to 0} \dfrac{\operatorname{cosec} x - \cot x}{x}$ $\left(\dfrac{1}{2}\right)$

* $\lim\limits_{x \to \frac{\pi}{4}} \dfrac{2-\sec^2 x}{1-\tan x}$ (2) $(\sec^2 x = 1+\tan^2 x)$

* $\lim\limits_{h \to 0} \dfrac{a^h - 1}{h} = \log_e^a$

* $\lim\limits_{\theta \to 0} \dfrac{\sin\theta}{\theta} = 1$

* $\lim\limits_{x \to 0} \dfrac{a^x + \sin x - 1}{x}$ $(\log_e^a + 1)$

* $\lim\limits_{x \to 0} \dfrac{e^x + \sin 2x - 1}{x}$ (3)

* $\lim\limits_{x \to 0} \dfrac{e^x + \sin x - 1}{x}$ (2)

* $\lim\limits_{x \to 0} \dfrac{e^x - \sin x - 1}{x}$ (0)