— Eskimos Limits: * Note: L should be $+\infty$

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

E

2) $\lim_{x\to 0} \frac{\sin x - x}{x^3}$ L'H: $\frac{\cos x - 1}{3x^2}$

D

L'H: $\frac{-\sin x}{6x}$ L'H: $\frac{-\cos x}{6} = -\frac{1}{6}$

3) $\lim_{x\to\infty} xe^{-x} = \frac{x}{e^x} = 0$

4) $\lim_{x\to 0} \frac{x\sin x}{\cos x - 1}$ L'H: $\frac{x\cos x + \sin x}{-\sin x}$

T

L'H: $\frac{x(-\sin x) + \cos x + \cos x}{-\cos x} = -2$

5) $\lim_{x\to -\infty} \frac{x+2}{x^2-x-6} = \frac{\cancel{x+2}}{(x-3)\cancel{(x+2)}} = \frac{1}{x-3} = 0$

G

6) $\lim_{x\to 0^+} \left(\frac{1}{x}\right)^x$ $\ln y = \lim_{x\to 0^+} x \ln\left(\frac{1}{x}\right)$

P

$y = \lim_{x\to 0^+} \left(\frac{1}{x}\right)^x$ $\lim_{x\to 0^+} \frac{\ln\left(\frac{1}{x}\right)}{\frac{1}{x}}$

L'H: $\frac{x \cdot \frac{-1}{\cancel{x^2}}}{\frac{-1}{\cancel{x^2}}}$ $\ln y = 0$

$e^0 = 1$

7) $\lim\limits_{x\to 0^+} x\ln x$ $\quad 0\cdot-\infty$ $\quad = \lim\limits_{x\to 0^+} \dfrac{\ln x}{\frac{1}{x}}$ $\quad$ L'H: $\dfrac{\frac{1}{x}}{\frac{-1}{x^2}}$

Y

$= \dfrac{1}{x}\cdot\dfrac{-x^2}{1} = -x = 0$

8) $\lim\limits_{x\to 1} \dfrac{\sin \pi x}{x-1}$ $\quad$ L'H: $\pi\cos \pi x = -\pi$

I

9) $\lim\limits_{x\to\infty} \left(1+\dfrac{1}{x}\right)^x$

R $\quad \ln y = \lim\limits_{x\to\infty} x\ln\left(1+\dfrac{1}{x}\right)$

$\lim\limits_{x\to\infty} \dfrac{\ln\left(1+\frac{1}{x}\right)}{\frac{1}{x}}$ $\quad \rightarrow \quad \dfrac{\frac{1}{1+\frac{1}{x}}\cdot\cancel{\frac{-1}{x^2}}}{\cancel{\frac{-1}{x^2}}}$

$\ln y = 1$

$y = e$

10) $\lim\limits_{x\to 1} \dfrac{\ln x}{x^2} = 0$

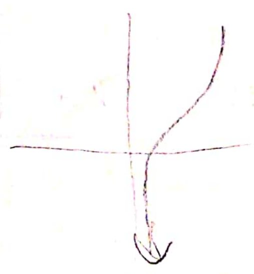
T

11) $\lim\limits_{x\to 0^+} \dfrac{\ln x}{\cot x}$ $\quad$ L'H: $\dfrac{\frac{1}{x}}{-\csc^2 x} = \dfrac{\frac{1}{x}}{\frac{-1}{\sin^2 x}} = \dfrac{-\sin^2 x}{x}$ $\quad -(\sin x)^2$

$-2\sin x\cdot\cos x = 0$

12) $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$ $\quad$ L'H: $\dfrac{\frac{1}{2\sqrt{x}}}{1} = \dfrac{1}{2}$

E



13) $\lim_{x\to\infty} \sqrt{x^2+1} - x$ $\quad \infty - \infty$ indeterminate

$$\frac{(\sqrt{x^2+1} - x)(\sqrt{x^2+1} + x)}{(\sqrt{x^2+1} + x)}$$

$$\frac{\cancel{x^2}+1-\cancel{x^2}}{\sqrt{x^2+1}+x} = \frac{1}{\sqrt{x^2+1}+x}$$

$$\lim_{x\to\infty} \frac{1}{\sqrt{x^2+1}+x} = 0$$

14) $\lim_{x\to 0} \frac{3e^x-3}{x}$

L'H: $\lim_{x\to 0} \frac{3e^x}{1} = 3$

15) $\lim_{x\to\infty} \frac{x^3}{e^x} = 0$ growth!

16) $\lim_{x\to 0^+} \left(\ln x + \frac{1}{x}\right)$

$-\infty + \infty \rightarrow$ indeterminate

$$\lim_{x\to 0^+} \left(\frac{x\ln x + 1}{x}\right) \Longrightarrow \lim_{x\to 0^+} \frac{0+1}{x} = \lim_{x\to 0^+} \frac{1}{x} = \boxed{\infty}$$

$$\lim_{x\to 0^+} x\ln x = \lim_{x\to 0^+} \frac{\ln x}{\frac{1}{x}} \quad \frac{-\infty}{\infty} \text{ L'H}$$

$$\lim_{x\to 0^+} \frac{\frac{1}{x}}{\frac{-1}{x^2}} = \lim_{x\to 0^+} (-x) = 0$$

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