

$$(4a) \lim_{x \rightarrow 0} \frac{\cos x - 1}{x^2} = \lim_{x \rightarrow 0} \frac{1 - \frac{x^2}{2} + o(x^2) - 1}{x^2} = \lim_{x \rightarrow 0} \frac{-\frac{x^2}{2} + o(x^2)}{x^2} = \lim_{x \rightarrow 0} \left(-\frac{1}{2} + o(1)\right) = \underline{-\frac{1}{2}}$$

$$(b) \frac{\cos x - 1}{x \ln(1+x)} = \frac{1 - \frac{x^2}{2} + o(x^2) - 1}{x(x + o(x))} = \frac{-\frac{x^2}{2} + o(x^2)}{x^2 + o(x^2)} = \frac{x^2 \left[-\frac{1}{2} + o(1)\right]}{x^2 [1 + o(1)]} \rightarrow -\frac{1}{2}$$

$$(c) \frac{x - \sin x}{x(1 - \cos x)} = \frac{x - \left(x - \frac{x^3}{6} + o(x^3)\right)}{x \left(1 - \left(1 - \frac{x^2}{2} + o(x^2)\right)\right)} = \frac{\frac{x^3}{6} + o(x^3)}{\frac{x^3}{2} + o(x^3)} = \frac{x^3 \left(\frac{1}{6} + o(1)\right)}{x^3 \left(\frac{1}{2} + o(1)\right)}$$

$$\xrightarrow{x \rightarrow 0} \frac{\frac{1}{6}}{\frac{1}{2}} = \frac{2}{6} = \underline{\frac{1}{3}}$$