1. Evaluate the following limit $\lim_{x\to 0}\left(\frac{1}{2x^2}+\frac{1}{x^3}+\frac{1}{x^4}-\frac{e^{\sin x}}{x^4}\right)$.

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

$$\underset{\text{L'H}}{=}\lim_{x\to 0}\frac{1+x-e^{\sin x}\cdot\cos x}{4x^3}\underset{\text{L'H}}{=}\lim_{x\to 0}\frac{1-e^{\sin x}\cdot\cos^2 x+e^{\sin x}\cdot\sin x}{12x^2}$$

$$\underset{\text{L'H}}{=}\lim_{x\to 0}\frac{-e^{\sin x}\cdot\cos^3 x+e^{\sin x}\cdot 2\cos x\sin x+e^{\sin x}\cdot\cos x\sin x+e^{\sin x}\cos x}{24x}$$

$$=\lim_{x\to 0}\left(\frac{1}{8}\cdot\frac{\sin x}{x}\cdot\cos x\cdot e^{\sin x}+\frac{1}{24}\cdot\frac{1-\cos^2 x}{x}\cdot\cos x\cdot e^{\sin x}\right)$$

$$=\frac{1}{8}\cdot 1\cdot 1\cdot 1+\lim_{x\to 0}\left(\frac{1}{24}\cdot\frac{\sin x}{x}\cdot\sin x\cdot\cos x\cdot e^{\sin x}\right)$$

$$=\frac{1}{8}+\frac{1}{24}\cdot 1\cdot 0\cdot 1\cdot 1=\frac{1}{8}$$