(2) $$\lim_{x\to 0}\frac{3x^2}{\cos(x)-1} = \lim_{h\to 0}\frac{6x}{-\sin(x)} = \lim_{h\to 0}\frac{6}{-\cos(x)} = \frac{6}{-\cos(0)} = \boxed{-6}$$

Form $\frac{0}{0}$ L'Hôpital Form $\frac{0}{0}$ L'Hôpital

(16) $$\lim_{x\to\infty}\frac{\ln(x)}{\sqrt{x}} = \lim_{x\to\infty}\frac{\frac{1}{x}}{\frac{1}{2\sqrt{x}}} = \lim_{x\to\infty}\frac{2\sqrt{x}}{x} = \lim_{x\to\infty}\frac{2}{\sqrt{x}} = \boxed{0}$$

Form $\frac{\infty}{\infty}$ L'Hôpital

(26) $$\lim_{x\to 0}\left(\frac{1}{x}-\frac{1}{e^x-1}\right) = \lim_{x\to 0}\left(\frac{e^x-1}{x(e^x-1)}-\frac{x}{x(e^x-1)}\right)$$

form $\infty-\infty$

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

form $\frac{0}{0}$

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

still form $\frac{0}{0}$ L'Hôpital

(42) $$\lim_{x\to 0^+}(e^x-1)^x = \lim_{x\to 0^+} e^{\ln(e^x-1)^x} = \lim_{x\to 0^+} e^{x\ln(e^x-1)}$$

form $\frac{0}{0}$

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

form $0\cdot\infty$

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

form $\frac{\infty}{\infty}$ so apply L'Hôpital

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

form $0/0$

$$= e^0 = \boxed{1}$$