 Name: SOLUTIONS

(1) [5] Evaluate $\lim_{x\to\infty} \frac{\cosh(x)}{e^x}$.

$$\lim_{x\to\infty} \frac{\cosh(x)}{e^x}$$

$$= \lim_{x\to\infty} \frac{e^x + e^{-x}}{2e^x}$$

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

$$= \boxed{\frac{1}{2}}$$

(2) [5] Evaluate $\lim_{t\to 0} \frac{e^t - 1}{t^5}$.

$$\lim_{t\to 0} \frac{e^t - 1}{t^5} \sim \text{"}\frac{0}{0}\text{"}$$

$$\stackrel{H}{=} \lim_{t\to 0} \frac{e^t \} \to 1}{5t^4 \} \to 0^+}$$

$$= \boxed{\infty}$$

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(3) [5] Evaluate $\lim_{x \to 0^+} x^{(x^2)}$. (Hint: $a^x = e^{x \ln(a)}$).

$$x^{(x^2)} = e^{x^2 \ln x}$$

$$\lim_{x \to 0^+} x^2 \ln x \sim \text{"} 0 \cdot (-\infty) \text{"}$$

$$= \lim_{x \to 0^+} \frac{\ln x}{x^{-2}} \sim \text{"} \frac{-\infty}{\infty} \text{"}$$

$$\stackrel{H}{=} \lim_{x \to 0^+} \frac{\left(\frac{1}{x}\right)}{\left(-2x^{-3}\right)}$$

$$= \lim_{x \to 0^+} \left(\frac{1}{\cancel{x}}\right)\left(-\frac{x^{\cancel{3}\,2}}{2}\right)$$

$$= 0$$

$$\therefore \lim_{x \to 0^+} x^{(x^2)} = \lim_{x \to 0} e^{x^2 \ln x} = e^0 = \boxed{1}$$