

Name: Solutions

Section: 11 12 13

$$1. \lim_{x \rightarrow 0^+} (e^x + x)^{1/x} \quad \text{Type } 1^\infty$$

$$\text{Set } L = \lim_{x \rightarrow 0^+} (e^x + x)^{1/x}$$

$$\therefore \ln L = 2$$

$$\Rightarrow L = e^{\ln L} = e^2$$

$$\Rightarrow \ln L = \lim_{x \rightarrow 0^+} \frac{1}{x} \cdot \ln(e^x + x) \quad \text{Type } \frac{0}{0}$$

$$\stackrel{H}{=} \lim_{x \rightarrow 0^+} \frac{1}{\frac{e^x + x}{e^x + 1}}$$

$$= \lim_{x \rightarrow 0^+} \frac{e^x + 1}{e^x + x} = \frac{e^0 + 1}{e^0 + 0} = 2$$

$$2. \int x \cos(2x) dx$$

IBP :

$$u = x \quad dv = \cos(2x) dx$$

$$du = dx \quad v = \frac{1}{2} \sin(2x)$$

$$\begin{aligned} &= \frac{x \sin(2x)}{2} - \int \frac{1}{2} \sin(2x) dx \\ &= \frac{x \sin(2x)}{2} + \frac{1}{4} \cos(2x) + C \end{aligned}$$