Quiz 5 Calc 3 11/2/2005

1. Evaluate $\int_2^\infty \frac{1}{x}\,dx$.

$$\lim_{b\to\infty} \int_2^b \frac{1}{x}\,dx = \lim_{b\to\infty} \ln x \Big|_2^b = \lim_{b\to\infty} \ln b - \ln 2$$

So as $b \to \infty$ $\ln(b)$ gets bigger and bigger. So it apreaches ∞

Excellent!

2. Evaluate $\int_0^\infty x \cdot e^{-x}\,dx$ [Hint: $\int x\cdot e^{-x}\,dx = -e^{-x} - x\cdot e^{-x} + C$].

$$= \lim_{b\to\infty} \left[-e^{-x} - xe^{-x}\right]_0^b$$

$$= \lim_{b\to\infty} \left[\left(-e^{-b} - be^{-b}\right) - \left(-e^{0} - 0e^{0}\right)\right]$$

$$= \lim_{b\to\infty} \left(-e^{-b} - \frac{b}{e^b} + 1\right)$$

$$= 0 - \lim_{b\to\infty} \frac{b}{e^b} + 1$$

$$\overset{L'H}{=} -\lim_{b\to\infty} \frac{1}{e^b} + 1$$

$$= -0 + 1$$

$$= 1$$