Name: SOLUTIONS

**Quiz #7 - March 25, 2005**

1. What is the definition for the Laplace transform $\mathcal{L}\{f(t)\}$.

$$F(s) = \int_0^\infty e^{-st} f(t)\, dt$$

2. Calculate $\mathcal{L}\{e^{3t}\}$ and determine for which $s$ it is defined. (Show your work!)

$$\int_0^\infty e^{-st} e^{3t}\, dt = \lim_{A\to\infty} \int_0^A e^{(3-s)t}\, dt$$

$$= \lim_{A\to\infty} \frac{1}{3-s} e^{(3-s)t}\Big|_0^A$$

$$= \lim_{A\to\infty} \frac{1}{3-s}\left(e^{(3-s)A} - 1\right)$$

$$= \frac{-1}{3-s} \quad \text{if } 3-s<0$$

$$= \boxed{\frac{1}{s-3} \quad \text{for } s>3}$$