MA214–03 Fall 2008
Quiz #8 - 10 Points
14 November 2008

NAME: Solutions

FORMULAS ON THE BOARD

1. (5 points). Find the function $f(t)$ that has the Laplace transform:

$$(\mathcal{L}f)(s) = \frac{2}{s^2+9} - \frac{5}{s+4}.$$

$$\frac{2}{s^2+9} = \frac{2}{3}\,\frac{3}{s^2+3^2} \rightarrow \frac{2}{3}\sin 3t$$

$$\frac{1}{s+4} \rightarrow e^{-4t}$$

$$\boxed{f(t) = \frac{2}{3}\sin 3t - 5e^{-4t}}$$

2. (5 points). Find the Laplace transform of the solution $y(t)$ of the initial value problem:

$$y'' + y' + 2y = e^{-3t}, \quad y(0) = 2, \quad y'(0) = 1.$$

$$s^2(\mathcal{L}y)(s) - s\,y(0) - y'(0) + s(\mathcal{L}y)(s) - y(0) + 2(\mathcal{L}y)(s)$$

$$= (s^2+s+2)(\mathcal{L}y)(s) - 2s - 1 - 2 = (s^2+s+2)(\mathcal{L}y)(s) - 2s - 3$$

$$= \frac{1}{s+3} \quad \text{(this is the L.T. of } e^{-3t}\text{)}$$

Solve for $(\mathcal{L}y)(s)$: $\quad (s^2+s+2)(\mathcal{L}y)(s) = 2s+3 + \frac{1}{s+3}$

$$(\mathcal{L}y)(s) = \frac{(2s+3)(s+3)+1}{(s^2+s+2)(s+3)}$$

$$\boxed{(\mathcal{L}y)(s) = \frac{2s^2+9s+10}{(s^2+s+2)(s+3)}}$$

the quadratic s^2+s+2 is irreducible over the reals