Math 202 – Quiz # 5

Name: Solution Ser. #_____

Solve the IVP:

$$4y'' + 4y' + 17y = 0 \qquad y(0) = -1, \quad y'(0) = 2$$

$$4\lambda^2 + 4\lambda + 17 = 0$$

$$\lambda = \frac{-4 \pm \sqrt{16 - 16(17)}}{8} = \frac{-4 \pm \sqrt{16(1-17)}}{8} = \frac{-4 \pm \sqrt{-16}}{8}$$

$$= \frac{-4 \pm 16i}{8} = -\frac{1}{2} \pm 2i \qquad \begin{cases} \alpha = -\frac{1}{2} \\ \beta = 2 \end{cases}$$

The general solution is:

$$y = e^{-x/2}\left[C_1 \cos 2x + C_2 \sin 2x\right]$$

$$y(0) = -1 \Rightarrow \boxed{C_1 = -1}$$

$$\therefore y = e^{-x/2}\left[-\cos 2x + C_2 \sin 2x\right]$$

$$y' = e^{-x/2}\left[2\sin 2x + 2C_2 \cos 2x\right] - \frac{1}{2}e^{-x/2}\left[\cos 2x + C_2 \sin 2x\right]$$

$$y'(0) = 2 \Rightarrow 2C_2 - \frac{1}{2}(-1) = 2 \Rightarrow \boxed{C_2 = \frac{3}{4}}$$

$\therefore$ The solution of the IVP is:

$$y = e^{-x/2}\left[-\cos 2x + \frac{3}{4}\sin 2x\right]$$