Name: Key
July 15, 2016
MAP 2302.4787
Cyr

Quiz 3
You must show all work to receive full credit!!

Problem 1. (2 points) Solve the initial value problem

$$y'' - 2y' + 2y = 0, \quad y(\pi) = e^{\pi}, \quad y'(\pi) = 0.$$

Auxiliary eqn: $r^2 - 2r + 2 = 0 \Rightarrow r = \frac{2 \pm \sqrt{4-8}}{2} = \frac{2 \pm 2i}{2} = 1 \pm i$

General solution: $y = c_1 e^t \cos t + c_2 e^t \sin t$

$\Rightarrow y' = c_1 e^t \cos t - c_1 e^t \sin t + c_2 e^t \sin t + c_2 e^t \cos t$

I.C.: $y(\pi) = -c_1 e^{\pi} = e^{\pi} \Rightarrow -c_1 = 1 \Rightarrow c_1 = -1$

$y'(\pi) = -c_1 e^{\pi} - c_2 e^{\pi} = 0 \Rightarrow c_2 e^{\pi} = e^{\pi} \Rightarrow c_2 = 1$

Final solution: $\boxed{y(t) = -e^t \cos t + e^t \sin t}$

Problem 2. (3 points) Find a general solution for the differential equation

$$y''' + 4y'' - 11y' + 6y = 0.$$

Auxiliary eqn: $r^3 + 4r^2 - 11r + 6 = 0$.

Since sum of coefficients is 1, try synthetic division with $r = 1$:

1	1	4	-11	6
		1	5	-6
	1	5	-6	0

$(r-1)(r^2 + 5r - 6) = 0$

$(r-1)^2 (r+6) = 0$

$\Rightarrow r = 1$ (mult. 2), $r = -6$

General solution: $\boxed{y(t) = c_1 e^t + c_2 t e^t + c_3 e^{-6t}}$