Math 274
29 Sept 2017

Quiz 4
Show Appropriate Work

Name: _____
Point Values in boxes.

1. Find a general solution for the following.

(a) [2] $x'' - x' - 6x = 0$

$r^2 - r - 6 = 0$

$(r-3)(r+2) = 0$

$r = 3 \quad r = -2$

$x = C_1 e^{3t} + C_2 e^{-2t}$

(b) [2] $y'' + 6y' + 9y = 0$

$r^2 + 6r + 9 = 0$

$(r+3)^2 = 0$

$r = -3$

$y = C_1 e^{-3t} + C_2 t e^{-3t}$

(c) [2] $x'' + 4x' + 5x = 0$

$r^2 + 4r + 5 = 0$

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

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

$r + 2 = \pm i$ so $r = -2 \pm i$

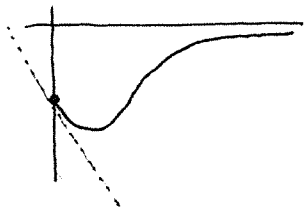
$x = C_1 e^{-2t} \cos t + C_2 e^{-2t} \sin t$

2. Consider the mass-spring system given by

$$y'' + 6y' + 8y = 0.$$

The system is imparted with initial conditions of $y(0) = -1$ and $y'(0) = -2$.

(a) [1] Sketch a graph of $y(t)$.



(b) [3] Solve the initial value problem.

$r^2 + 6r + 8 = 0$

$(r+2)(r+4) = 0$

$y = C_1 e^{-2t} + C_2 e^{-4t}$

$y' = -2C_1 e^{-2t} - 4C_2 e^{-4t}$

The initial data $y(0) = -1$ & $y'(0) = -2$ implies

$-1 = C_1 + C_2$, and

$-2 = -2C_1 - 4C_2$

$-2 = 2C_1 + 2C_2$

$-2 = -2C_1 - 4C_2$

$-4 = -2C_2$

so $C_2 = 2$

& $C_1 = -3$

$y = -3e^{-2t} + 2e^{-4t}$