Math 274 Quiz 5
Sections: 4.4-4.5
22 February 2019

1. For $t > 0$, consider the mass spring system

$$x'' + \mu x' + kx = 0. \quad (1)$$

(a) Let $x(t)$ be a solution to this system with graph below.

- i. Is the system (1) Overdamped, Underdamped, or Undamped.
- ii. Which of the following may be solutions to this system?
  - $x(t) = 3e^{-t} \cos 4t$
  - $x(t) = -4 \sin t + 3 \cos t$
  - $x(t) = 4e^{-3t} - 3e^{-2t}$

(b) Let $x(t)$ be a solution to this system with graph below.

- i. Is the system (1) Overdamped, Underdamped, or Undamped.
- ii. Which of the following may be solutions to this system?
  - $x(t) = 3e^{-t} \cos 4t$
  - $x(t) = -4 \sin t + 3 \cos t$
  - $x(t) = 4e^{-3t} - 3e^{-2t}$

(c) Let $x(t)$ be a solution to this system with graph below.

- i. Is the system (1) Overdamped, Underdamped, or Undamped.
- ii. Which of the following may be solutions to this system?
  - $x(t) = 3e^{-t} \cos 4t$
  - $x(t) = -4 \sin t + 3 \cos t$
  - $x(t) = 4e^{-3t} - 3e^{-2t}$

2. Find the solution to the initial value problem

$$y'' + y = 10e^{2t}, \quad y(0) = 5, y'(0) = 1.$$

- $y = C_1 \cos t + C_2 \sin t$
- $y_p = Ae^{2t}$
- $y_p'' = 4Ae^{2t}$

- $y_p'' + y_p = 5Ae^{2t}$ so $A = 2$

- $y = C_1 \cos t + C_2 \sin t + 2e^{2t}$
- $y(0) = 5 \Rightarrow C_1 = 3$
- $y'(0) = 1 \Rightarrow C_2 = -3$

- $y = 3 \cos t - 3 \sin t + 2e^{2t}$