Exam 4 Review: Sections 4.1-4.2

Section 4.1 Find the general form of the solution to the system

$$x' = y$$
$$y' = 2x + y$$

Section 4.1 Find the solution to the system

$$x' = 10y,\ y' = -10x;\ x(0) = 3,\ y(0) = 4$$

Section 4.1 Transform the following differential equations or systems into an equivalent system of first-order differential equations.

(a) $x'' + 3x' + 7x = t^2$

(b) $x'' + 4x - x^3 = 0$

(c) $t^2x'' + tx' + (t^2 - 1)x = 0$

(d) $x'' + 2x' + 26x = 82\cos 4t$

(e) $x'' = (1 - y)x,\ y'' = (1 - x)y$

Section 4.2 Solve the following system of equations

$$x' = x - 2y, \quad y' = 2x - 3y$$

Section 4.2 Solve the following system of equations

$$x' = -3x + 2y,\ y' = -3x + 4y;\ x(0) = 0,\ y(0) = 2$$

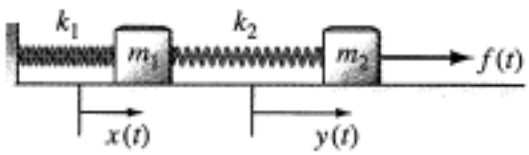
Section 4.2 Solve the following system of equations

$$\begin{aligned} x' - 4x + 3y &= 0 \\ -6x + y' + 7y &= 0 \end{aligned}$$

Section 4.2 Solve the following system of equations

$$\begin{aligned} x' &= 2x + y \\ y' &= x + 2y - e^{2t} \end{aligned}$$

Section 4.2 Consider the following diagram:



Equilibrium positions

Whenever $k_1 = 4,\ k_2 = 2,\ m_1 = 2,\ m_2 = 1$ and $f(t) = 0$ the system becomes

$$x'' + 3x - y = 0$$
$$-2x + y'' + 2y = 0$$

Find the general form of this system of equations.