DEPARTMENT OF MATHEMATICS
UNIVERSITY OF KANSAS
Math 221 Sample EXAM 2

Your Name: _____

On this exam, you may use a calculator and the book.

It is not sufficient to just write down the answers. You must explain how you arrived at your answers and how you know they are correct.

1	(40)	_____
2	(40)	_____
3	(40)	_____
4	(40)	_____
5	(40)	_____
Total	(100)	_____

- **(40 points)** Find the solution of the initial value problem using the Laplace transform.

$$\left| \begin{array}{l} y'' - y' - 2y = 0 \\ y(0) = 1, y'(0) = 1 \end{array} \right.$$

- **(40 points)** Find the inverse Laplace transform of the function

$$F(s) = \frac{2(s-1)e^{-2s}}{s^2 - 2s + 2}.$$

- **(40 points)** Find the solution of the initial value problem and describe its behavior for increasing t. Use Laplace transform.

$$\left| \begin{array}{l} y'' + 2y' + 5y = 1 - u_{10}(t) \\ y(0) = 0, y'(0) = 0 \end{array} \right.$$

- **(40 points)** Find the solutions of the linear system and sketch the phase portrait.

$$x' = \begin{pmatrix} 1 & -5 \\ 1 & -3 \end{pmatrix} x, \quad x(0) = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

- **(40 points)** Find the general solution of the linear system

$$x' = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 1 & -1 \\ -8 & -5 & -3 \end{pmatrix} x$$