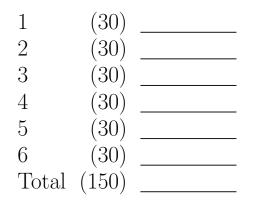# DEPARTMENT OF MATHEMATICS
UNIVERSITY OF KANSAS
MATH 220 - EXAM 2

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	(30)	_____
2	(30)	_____
3	(30)	_____
4	(30)	_____
5	(30)	_____
6	(30)	_____
Total	(150)	_____

- **(30 points)** Solve the initial value problem, sketch the graph of the solution and describe its behavior for increasing t.

$$\left| \begin{array}{l} y'' + 4y' + 5y = 0 \\ y(0) = 1, y'(0) = 0 \end{array} \right.$$

- **(30 points)** Find the general solution of the differential equation

$$y'' - 2y' - 3y = 3te^{2t}.$$

- **(30 points)** A mass weighing 2 lb stretches a spring 6 in. If the mass is pulled down an additional 3 in. and then released, and if there is no damping, determine the position u of the mass at any time t. Draw the graph of u(t), find the frequency, period and amplitute of the motion.

- **(30 points)** Find the solution to

$$
\left|
\begin{array}{l}
2y'' - 3y' + y = 0 \\
y(0) = 2 \\
y'(0) = 1/2
\end{array}
\right.
$$

- **(30 points)** Use the method of undetermined coefficients to find a particular solution of
$$y'' - 6y' + 8y = x + e^{2x}.$$
Find the general solution of this equation.

- **(30 points) Bonus Problem** An 2-pound weight stretches a spring 6 inches. Suppose the weight is released from the equilibrium position with the upward speed 16 ft/s. Find the motion of the spring-mass system if it is driven by an external force $f(t) = 7 \cos t$. Is the motion a periodic one ? If so, what is the period ? (The gravitation constant $g = 32$ ft/s^2 and 1 foot $= 12$ in.)