Differential Equations **Homework 8** **Name:**
MWF 10-10:50 or MWF 11-11:50

Show your work! Answers without supporting work will not be given credit. Print this assignment and write your work in the spaces provided.

1. Find the solution to initial value problem $t^2y'' - ty' + 5y = 0,\ \ y(1) = 2,\quad y'(1) = 4.$

The general solution:

IVP solution:

2. Solve $y'' - \frac{3}{t}y' + \frac{4}{t^2}y = \ln(t),\ \ y(1) = 7,\ \ y'(1) = 4.$

The homogeneous solution:

The general solution:

IVP solution:

3. (a) A mass of 5 kg stretches a spring 2 cm. If the mass is pushed downward, stretching the spring by 1 cm under the equilibrium position and set in motion by a upward velocity of 4 cm/sec and if there is no damping, find the **position** $u(t)$ at any time t. Determine the **frequency**, the **period** and the **amplitude** of the motion.[1]

$u(t) =$

$\omega_0 =$

$T =$

$R =$

(b) If we add damping to the system in (a) with coefficient of damping $\gamma = 10$ kg/sec. What is the position of the mass, $u(t)$ at any time t if the same initial values apply? Give the **quasi-frequency** if it applies? What is the behaviour of the motion as $t \to \infty$?

$u(t) =$

$\mu =$

$\lim_{t\to\infty} u(t) =$

[1] Assume $g = 10\ m/sec^2$ and the upward direction is positive