Math 250 Exam #3 Fall '08	Show all work (and answers) on the blank paper provided. Write nothing on this paper other than your name.	Name:

1	20	
2	20	
3	20	
4	20	
5	20	
6	20	
7	20	
8	20	
total	160	
curve		
%		

Problems 1 & 2 will involve the model $\dfrac{dT}{dt} = K\left[M\left(t\right) - T\left(t\right)\right] + H\left(t\right) + U\left(t\right)$, where M is outside temperature, T is temperature of object, H is heat source, and U represents a climate-control system (where applicable). $1/K$ is called a "time constant".

1) On a hot Saturday morning while corporate drones are toiling inside a building, an air conditioner keeps the temperature at 24ºC. A noon the air conditioner is turned off and the drones trudge home. The temperature outside the building is a constant 39ºC for the rest of the afternoon. If the time constant for the building is 4 hr, what will be the temperature inside the building at 1:30 pm? When will the temperature inside the building reach 36ºC?

2) A garage with no heating or cooling has a time constant of 3 hr. If the outside temperature varies as a sine wave with a minimum of 47ºF at 2:00 am and a maximum of 82ºF at 2:00 pm, determine the times at which the building reaches its lowest and highest temperature, assuming the exponential term has died off.

3) $y'' + 2y' + 4y = 5\sin 3t$ has a solution of the form $A\cos 3t + B\sin 3t$. Find A and B.

4) Solve $y'' - 4y' + 3y = 0, \quad y\left(0\right) = 1, \quad y'\left(0\right) = 1/3$

5) Solve $y''' - 7y'' + 7y' + 15y = 0$

6) $y'' + 2y' + 17y = 0, \quad y\left(0\right) = 1, \quad y'\left(0\right) = -1$

7) Find a particular solution to the differential equation $y'' + y = 4x\cos x$

8) Determine the form of a particular solution for $y'' + 3y' - 7y = t^4 e^t$. *Do not evaluate coefficients!*