Math 322 ASSIGNMENT 8, SPRING 2013 **Due at 3 PM Monday, April 21st**

1. In this exercise you will be solving the IVP $2y'' + 2y' + 5y = g(t), \quad y(0) = 0, \quad y'(0) = 0,$ where $g(t)$ is two from $t = 3$ to $t = 18$ and zero at all other times.

   (a) Graph $g(t)$.

   (b) Give $g(t)$ as a single function, and substitute it into the ODE.

   (c) Take the Laplace transform of both sides of the ODE and solve for $Y(s)$.

   (d) Use Wolfram Alpha to determine $y(t)$. The result you get will be really crazy, but there will be two graphs of the solution displayed. Sketch a reasonably neat and large version of the second graph, but starting only at zero.

2. Solve the IVP $\mathbf{x}' = \begin{bmatrix} 2 & -1 \\ 1 & 4 \end{bmatrix} \mathbf{x}, \quad \mathbf{x}(0) = \begin{bmatrix} 3 \\ 1 \end{bmatrix}.$

3. Solve the system $\mathbf{x}' = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix} \mathbf{x}.$

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