DUE: W 02/10/99

NOTE: Use of m-file *recur* not required - probably easier to write your own m-file with a loop.

1. Problem 2.24 (the answer given in part (a) can be rewritten as
   $y(t) = \sqrt{5}e^{-0.5t}\cos(2t - 26.6^\circ)u(t)$)

2. Problem 2.26

3. A model of a high-speed vehicle on a horizontal surface is given below.

$$M\frac{dv(t)}{dt} + k_f v(t) + k_d v^2(t) = x(t)$$
$$v(0) = 5 = \text{initial velocity}$$
$$v(t) = \text{vehicle velocity}$$
$$x(t) = 8t(u(t) - u(t-4)) = \text{drive / brake force}$$
$$M = 10 = \text{vehicle mass}$$
$$k_f = 1 = \text{friction coefficient}$$
$$k_d = 0.5 = \text{drag coefficient}$$

a) Solve for v(t) using Laplace Transforms if possible.
b) Using Euler's approximation of derivatives with T arbitrary, derive a difference equation model.
c) Using the answer in part (b) with T = 0.2, compute the approximation to v(t) using recursion for 0 <= t <= 20.
d) Using the answer in part (b) with T = 2.0, compute the approximation to v(t) using recursion for 0 <= t <= 20.
e) Are you more confident in your approximation from part (c) or (d)? Why?