   Homework 3 – due W 02/29/06
   Submit important plots, etc., for grading

1. [50 points]
a) Create a matlab function m files, costran.m, and sintran.m as activation functions that give the cosine(n) and the sine(n) of the neuron signals n for use in a Fourier series neural network.
b) Give a signal flow or block diagram for a neural network having an input layer with 4 cosine, 4 sine, and one constant term and a linear output layer to yield a single output that is an approximate Fourier series for a function approximation (for an input scalar variable).
c) Train on 21 equally spaced samples, $x_i=(i/20)*(2\pi)$ for i=0,…20, such a neural network which is to form a nine term (4 cosine, 4 sine, 1 constant) Fourier series over $[0 \ 2\pi]$ of the function
   $f(x)= 3x+5\exp(x/2)$
Assume that this function is periodically extended by 2π shifts along the x axis.
d) Directly compute using integral formulas for the coefficients of the corresponding 9 coefficients of the first terms of a sine, cosine Fourier series and compare with the weights found in c).

2. [50 points]
   a) Plot radial basis functions, RBF(x/σ), over $-10<x<10$ for four different values of the spread, σ, in the range 0.1 to 100 (use a log scale in σ, that is, 0.1, 1, etc.).
   b) Find an RBF network to approximate the f(x) of problem 1c) above.