%% Homework 2 for 671

%Problem 47

incr = 0.0001;

t = -1:incr:1;

x1 = 3\*t.^2 - 1;

x2 = 5\*t.^3 - 3\*t;

x3 = 2\*t.^2-t;

% x1 and x2

angleFunkyness(x1,x2,incr,t)

% x1 and x3

angleFunkyness(x1,x3,incr,t)

% x2 and x3

angleFunkyness(x3,x2,incr,t)

function [theta] = angleFunkyness(V1,V2,incr,t)

%angleFunkyness - Calculates the angle between two vectors

% Find the norm of the two vectors, and the dot product

tmp = V1.\*V1\*incr;

normV1 = sum(tmp(1:length(t)-1));

tmp = V2.\*V2\*incr;

normV2 = sum(tmp(1:length(t)-1));

tmp = V1.\*V2\*incr;

dotProd = sum(tmp(1:length(t)-1));

theta = acos(dotProd/(normV1 \* normV2))/pi\*180;

end

%Problem 77

% Declaration of our 4 functions AS COLUMN VECTORS

P1 = [1;1;1;1];

P2 = [1;1;0;1];

P3 = [1;1;0;0];

P4 = [1;0;1;1];

% Perform the Gram-Schmidt orthogonalization by normalizing each vector,

% with respect to each other. This is a recursive process.

Q1 = P1/normOp(P1); % custom norm function

e2 = P2 - innerProduct(P2,Q1)\* Q1;

Q2 = e2/normOp(e2);

e3 = P3 - innerProduct(P3,Q1)\* Q1 - innerProduct(P3,Q2)\* Q2;

Q3 = e3/normOp(e3);

e4 = P4 - innerProduct(P4,Q1)\* Q1 - innerProduct(P4,Q2)\* Q2 - innerProduct(P4,Q1)\* Q1;

Q4 = e4/normOp(e4);

% FUNCTION CODE FOR REFERENCE

% function [ output ] = innerProduct(Vect1,Vect2)

% %innerProduct - takes the inner product of two same-sized vectors

% % TODO - find the page number for this in your book....

%

% % a typical inner product will integrate the product of the two

% % functions/vectors over their respective range, but <f,g> can also be

% % computed as g^t \* f \* (interval increments)

%

% increment = 1/4; % for hw 2, we are dividing the function into 4ths

% output = Vect1' \* Vect2 \* increment;

% end

% function [ output\_args ] = normOp( input\_args )

% output\_args = sqrt(innerProduct(input\_args,input\_args));

% end

% Plots - this is something that I need to figure out how to do....

t = 0:0.001:1;

ln = length(t);

b(1,1:floor(ln/4)) = 1;

b(2,floor(ln/4)+1:floor(ln/2)) = 1;

b(3,floor(ln/2)+1:floor(3\*ln/4)) = 1;

b(4,floor(3\*ln/4)+1:ln) = 1;

subplot(2,2,1);

plot(t,Q1'\*b);

title('q1(t)');

subplot(2,2,2);

plot(t,Q2'\*b);

title('q2(t)');

subplot(2,2,3);

plot(t,Q3'\*b);

title('q3(t)');

subplot(2,2,4);

plot(t,Q4'\*b);

title('q4(t)');

