%1-1 Lagrange polynomial interpolation

%x,f:The input data, they are voctors of size 1 x n

%xi: the vector of size 1 x m at which the function has to be evaluated

%fi:The value of the Lagrange polynomial interpolation at xi

function fi=LagrangeInterpolation(x,f,xi)

fi=zeros(1, length(xi));

diff\_mat\_1=repmat(xi', 1, length(x))-repmat(x, length(xi), 1);

diff\_mat\_2=repmat(x' , 1, length(x))-repmat(x, length(x) , 1);

diff\_mat\_2(1:length(x)+1:end)=1;

for i=1:length(xi)

    diff\_mat\_3=repmat(diff\_mat\_1(i,:), length(x), 1);

    diff\_mat\_3(1:length(x)+1:end)=1;

    fi(i)=f\*prod(diff\_mat\_3./diff\_mat\_2, 2);

end

%

% fi=zeros(size(xi));

% np1=length(f);

% for i=1:np1

%     z=ones(size(xi));

%     %The i-th Lagrange basisfunction

%     for j=1:np1

%         if i~=j,

%            z=z.\*(xi-x(j))/(x(i)-x(j));

%        end

%     end

%     fi=fi+z\*f(i);

%  end