Name:

Math 451 ... Exam 3 - In Class

1) Write function *gauss(A)* that will take as input a matrix A and perform gaussian elimination with pivoting on the matrix and then return the modified A.

2) For the Lagrange interpolating polynomial function ...

```
function [y] = lagrange(x,xc,yc)

   n = length(xc);

   y = 0;

   for k = 1:n

      pt = 1;

      for j = [1:k-1 k+1:n]

         pt = pt.*(x - xc(j))./(xc(k) - xc(j));

      end

      t = pt.*yc(k);

      y = y + t;

   end
```

... comment on each of the variables, explain what they represent, and explain what each line is doing.

3) Assume you have a function c = *linearsolver*(A,b) that solves $Ac = b$, a square systems of equations (number of equations = number of variables). Write a script that will find the coefficients of the least squares fit quadratic polynomial to the data (-1,0), (0,1), (1,1), (2,2), (3,2), (4,0). It will then plot, in the same figure window, the data points with red circles and the quadratic polynomial with a blue curve.

#3

take home:

$Ax = b$

A is square → determined → gauss, pivot

rows > cols → overdet → $A^T A x = A^T b$

cols > rows → underdet → ??,

4) Write the function *simpint(f,a,b)* for the adaptive quadrature formula using Simpson's rule. Comment your code and explain the technique.

→ Fix the code:

5) In class it was shown that the adaptive quadrature function for Simpson's formula of integration has an improved approximate for the area ...

A = S4 + (S4 - S2)./15;

... find a simliar formula for the trapazoidal rule. Show all algebra work.

[illegible]

6) Write a self-recursive function called *recseq(n)* that returns the following sequence as a vector:

$a_1 = 2$, $a_2 = 2$ and for $n = 3, 4, 5, \ldots$ the recursive formula is $a_n = 2\, a_{n-1} + a_{n-2} + 1$.