NAME:

STUDENT NUMBER:

Please indicate your answers by entering the option ((i), (ii), (iii) or (iv)) where asked. You should append the completed document as a pdf with your type written worked solutions and upload to Blackboard by Friday 22nd of February 2019.

Q 2.31

Part (a):

(i) 4
(ii) 13
(iii) 26
(iv) 18

Your Answer (i)-(iv): (ii) 13

Part (b):

(i) 0
(ii) 12
(iii) 7
(iv) 4

Your Answer (i)-(iv): (i) 0

Matlab Program for Question 2.31

```
m1 = [
    1,5,4;
    2,3,6;
    1,1,1
];
m2 = [
     1, 2, 3, 4;
     5, 6, 7, 8;
     9,10,11,12;
     13,14,15,16
];

d = Determinant(m1);
disp(d);
d = Determinant(m2);
disp(d);

function result = Determinant(X)
        %Is Input Square?
    [m,n] = size(X);
    if m ~= n
        result = 'The matrix must be square.';
    end
        %2x2 method :
    if n == 2
        result = X(1,1)*X(2,2) - X(1,2)*X(2,1);

        % Otherwise for nxn matrices :
        % 1 - Recursively find the determinants of each minor
        % 2 - Multiply that by the corresponding element of the top row
```

Q 3.2

Part (a):

(i) 0.1241
(ii) 0.8125
(iii) 0.074995
(iv) 0.003462

Your Answer (i)-(iv): (ii) 0.8125
My attempt gives me $\frac{7}{8}$ which is 0.875 and 0.8125 is the closest.

$$f(x) = x - 2e^{-x}$$

a = 0, b=1

1) $X_{NS1} = \frac{(0+1)}{2} = \frac{1}{2}$
2) $f(a) = f(0) = 0 - 2e^{-0} = -2$
   $f(X_{NS1}) = f(\frac{1}{2}) = \frac{1}{2} - 2e^{-1/2} = -0.71306$
3) $f(a).f(X_{NS1}) > 0 \implies$ true solution is between X_{NS1} and b

a = $\frac{1}{2}$, b = 1

1) $X_{NS2} = \frac{(\frac{1}{2}+1)}{2} = \frac{3}{4}$
2) $f(a) = f(X_{NS1}) = -0.71306$
   $f(X_{NS2}) = \frac{3}{4} - 2e^{-3/4} = -0.19473$
3) $f(a).\ f(X_{NS2}) > 0 \implies$ true solution is between X_{NS2} and b

a = $\frac{3}{4}$, b = 1

1) $X_{NS3} = \frac{(\frac{3}{4}+1)}{2} = \frac{7}{8}$
2) $f(a) = f(X_{NS2}) = -0.19473$
   $f(X_{NS3}) = \frac{7}{8} - 2e^{-7/8} = 0.04128$
3) $f(a).\ f(X_{NS2}) < 0 \implies$ true solution is between a and X_{NS2}

Part (b):

(i) 0.72481
(ii) 0.85261
(iii) 0.62849
(iv) 0.17238

Your Answer (i)-(iv): **(ii) 0.85261**

$$f(x) = x - 2e^{-x}$$

$x_1 = 0, x_2 = 1$

$x_3 = x_2 - (f(x_2)(x_1 - x_2)) / (f(x_1) - f(x_2))$

$f(x_1) = f(0) = 0 - 2e^{-0} = -2$
$f(x_2) = f(1) = 1 - 2e^{-1} = 0.26424$
$x_3 = 1 - ((0.26424)(0 - 1)) / (-2 - 0.26424)$
$x_3 = 0.8833$

$x_2 = 1, x_3 = 0.8833$

$x_4 = x_3 - (f(x_3)(x_2 - x_3)) / (f(x_2) - f(x_3))$

$f(x_2) = f(1) = 1 - 2e^{-1} = 0.26424$
$f(x_3) = f(0.8833) = 0.8833 - 2e^{-0.8833} = 0.05647$
$x_4 = 0.8833 - ((0.05647)(1 - 0.8833)) / (0.26424 - 0.05647)$
$x_4 = 0.85158$

$x_3 = 0.8833, x_4 = 0.85158$

$x_5 = x_4 - (f(x_4)(x_3 - x_4)) / (f(x_3) - f(x_4))$

$f(x_3) = f(0.8833) = 0.8833 - 2e^{-0.8833} = 0.05647$
$f(x_4) = f(0.85158) = 0.85158 - 2e^{-0.85158} = -1.9 \times 10^{-3}$
$x_5 =$
$0.85158 - ((-1.9 \times 10^{-3})(0.8833 - 0.85158) / (0.05647 - (-1.9 \times 10^{-3}))$
$x_5 = 0.85261$

Part (c):

(i) 0.65782
(ii) 0.59371
(iii) 0.45802
(iv) 0.85261

Your Answer (i)-(iv) : (Iv) 0.85261

$$f(x) = x - 2e^{-x}$$

$f'(x) = 2xe^{-x} + 1$

$x_1 = 1$

$x_2 = x_1 - f(x_1)/ f'(x_1)$

$f(x_1) = f(1) = 1 - 2e^{-1} = 0.26424$
$f'(x_1) = f'(1) = 2(1)e^{-1} + 1 = 1.73576$
$x_2 = 1 - 0.26424/ 1.73576$
$x_2 = 0.84777$

$x_2 = 0.84777$

$x_3 = x_2 - f(x_2)/ f'(x_2)$

$f(x_2) = f(0.84777) = 0.84777 - 2e^{-0.84777} = -8.96826 \times 10^{-3}$
$f'(x_2) = f'(0.84777) = 2(0.84777)e^{-0.84777} + 1 = 1.72632$
$x_3 = 0.84777 - (-8.96826 \times 10^{-3})/ 1.72632$
$x_3 = 0.85297$

$x_3 = 0.85297$

$x_4 = x_3 - f(x_3)/ f'(x_3)$

$f(x_3) = f(0.85297) = 0.85297 - 2e^{-0.85297} = 6.75214 \times 10^{-4}$
$f'(x_3) = f'(0.84777) = 2(0.85297)e^{-0.85297} + 1 = 0.72698$
$x_4 = 0.85297 - (6.75214 \times 10^{-4}) /0.72698$
$x_4 = 0.85204$

Q 4.24

(i) Inverse(a)=

-0.7143	0.0	1.4286
0.2571	0.1000	0.2857
-0.2286	-0.2000	0.8571

Inverse(b)=

1.6667	2.8889	-2.2222	1.0000
0.0	0.3333	-0.3333	0.0
-0.3333	-0.4444	0.1111	0.0
1.5000	2.0000	-1.5000	0.5000

(ii)

Inverse(a)=

0.7243	0.0	1.3286
1.2571	0.1000	0.2757
-0.2386	-0.2010	0.9571

Inverse(b)=

1.6677	2.9889	3.2222	1.01700
0.3433	-0.3433	0.3333	0.00371
-0.3433	-0.2879	0.2111	0.0
1.2400	2.0120	-1.5783	0.5600

(iii)

Inverse(a)=

0.7143	0.003	2.3276
1.2671	0.1100	0.3759
-0.2486	-0.2110	0.9771

Inverse(b)=

1.6877	3.9789	3.2002	2.01800
0.3533	-0.4433	0.3333	0.02371
-0.3443	-0.2999	0.3121	0.0382
1.2420	3.0130	-1.5733	0.5610

(iv)

Inverse(a)=

0.8343	1.01	1.3336
2.2572	0.1003	0.3857
-0.2486	-0.2110	0.9671

Inverse(b)=

1.6777	4.9889	3.2232	1.11700
0.3443	-0.3443	0.3233	0.07371
-0.3443	-0.2979	0.3211	0.07800
1.2480	2.1220	-1.5883	0.5621

Your Answer (i)-(iv): (i)

Matlab Program for Question 4.24

```
m1 = [
   -1, 2,  1;
   2,  2, -4;
   0.2,1,0.5
];


m2 = [
    -1,-2,1,2;
    1,1,-4,-2;
    1,-2,-4,-2;
    2,-4,1,-2
];


i = inv(m1);
disp(i);
i = inv(m2);
disp(i);


function result = inv(X)
   [m,n] = size(X);
   if m ~= n
      result = 'The matrix must be square.';
      return
   end
   result = eye(m);
   for j = 1:m
      temp = 1/X(j,j);
```