

Maths

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Word count: 446

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1. If $X=2.0$ and $y=3.0$, use matlab to evaluate:

[i] $3x^2-2y^3$

```
>> x=2.0
```

```
x = 2
```

```
>> y=3.0
```

```
y = 3
```

```
>> 3*x^2-2*y^3
```

```
ans = -42
```

[ii] $\ln(x*y)$

```
>> log(x*y)
```

```
ans = 1.7918
```

[iii] $\sqrt{x/y}$

```
>> sqrt(x/y)
```

```
ans = 0.8165
```

[iv] e^y

```
>> exp(y)
```

```
ans = 20.0855
```

[v] $e^{-x} + \log(y)$

```
>> exp(-x) + log10(y)
```

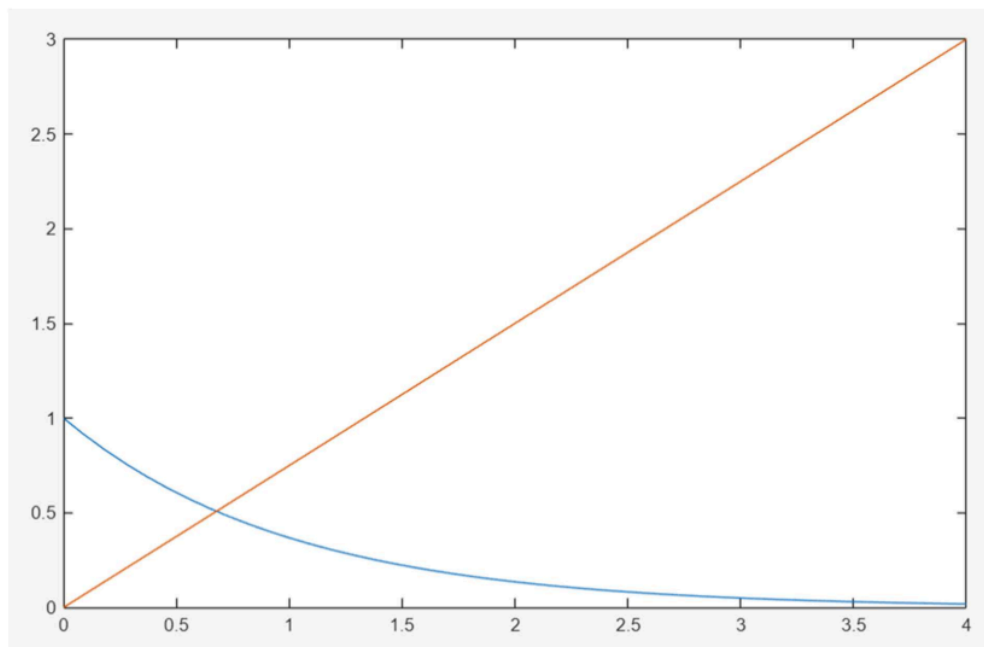
```
ans = 0.6125
```

2. Draw the graphs, in the same window of

$Y = e^{-x}$

$Y = 0.75x$

From $x=0$ to $x=4$

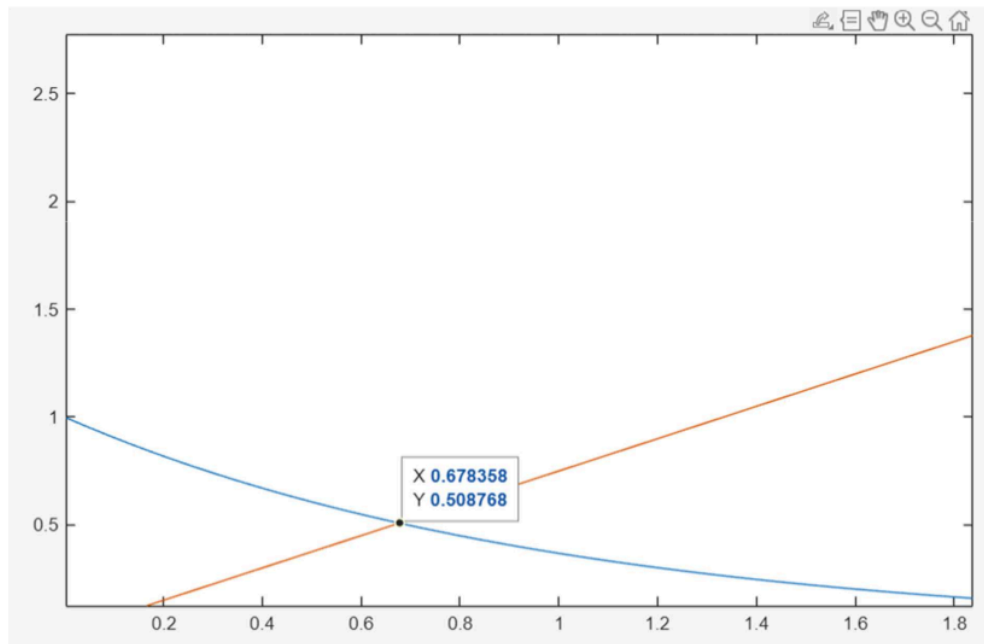


0.678358

0.508768

X=0.678

Y=0.509



3. Use solve to find all roots of the equation

$$X^3 - 6x^2 + 11x - 6 = 0$$

```
>> syms x
```

```
>> solve(x^3-6*x^2-11*x-6)
```

ans =

```
root(z^3 - 6*z^2 - 11*z - 6, z, 1)
```

```
root(z^3 - 6*z^2 - 11*z - 6, z, 2)
```

```
root(z^3 - 6*z^2 - 11*z - 6, z, 3)
```

4. Find the gradient m and constant c in the equation of the straight line which is a least squares approximation in the data given in the following table:

x	1.0	2.0	3.0	4.0	5.0	6.0
y	4.1	6.7	9.9	13.3	16.4	19.3

Estimate the value of y at x=4.5

```
>> x=[1.0 2.0 3.0 4.0 5.0 6.0]
```

```
x = 1 2 3 4 5 6
```

```
>> y = [4.1 6.7 9.9 13.3 16.4 19.3]
```

```
y = 4.1000 6.7000 9.9000 13.3000 16.4000 19.3000
```

```
>> p = polyfit(x,y,1)
```

```
p = 3.1000 0.7667
```

```
>> yi = polyval(p, 4.5)
```

```
yi = 14.7167
```

5. Find the second derivative of

$$Y = \sin(6x)$$

Show that y satisfies the equation

$$D^2/dx^2 + 36y = 0$$

```
>> syms x
>> y = sin(6*x)

y = sin(6*x)

>> y2 = diff(y,2)

y2 = -36*sin(6*x)

>> y2 + 36*y

ans = 0
```

6. For the two vectors $a=(2, -2, 3)$ and $b=(2, -3, 2)$ find:

- a. The dot product of a and b
16
- b. The cross product of a with b
5 2 -2

```
>> a=[2 -2 3]

a = 2   -2   3

>> b=[2 -3 2]

b = 2   -3   2

>> dot(a,b)

ans = 16

>> cross(a,b)

ans = 5   2   -2
```

7. [i] find the determinant $|A|$

-11.0000

[ii] a^{-1} the inverse of matrix A

```
0.0909   0.0909   0.2727
-0.3636   0.6364   -0.0909
0.6364   -0.3636   -0.0909
```

```
>> a=[1 1 2; 1 2 1; 3 -1 -1]
```

```
a =
```

```
1 1 2  
1 2 1  
3 -1 -1
```

```
>> det(a)
```

```
ans = -11.0000
```

```
>> inv(a)
```

```
ans =
```

```
0.0909 0.0909 0.2727  
-0.3636 0.6364 -0.0909  
0.6364 -0.3636 -0.0909
```

8. The following simultaneous equations are represented by the matrix equation $AX=B$, where A is the matrix of question 7, $X=[x \ y \ z]^T$ and $B=[4, 4, 1]^T$
- $$X + Y + 2z = 4$$
- $$X + 2y + 1z = 4$$
- $$X + 1y - 1z = 1$$

```
>> B=[4; 4; 1]
```

```
B =
```

```
4  
4  
1
```

```
>> solutions = inv(a)*B
```

```
solutions =
```

```
1.0000
```

1.0000

1.0000

FINAL GRADE

GENERAL COMMENTS

89/100

Matlab Assessment Feedback

-

Q1 Evaluating functional expressions [10 marks]

All expressions evaluated correctly

[10 marks]

Q2 Plotting graphs and solving non-linear simultaneous equations [12 marks]

A key or text here would be useful to label graphs and zoom in until the graphs almost behave a straight lines for a more accurate solution.

[10 marks]

Q3 Solving cubic equations

[8 marks]

Ok, but would be better to have used the solve function to express the answers only as 1, 2 3 and assign those to x values

[6 marks]

Q4 Least Squares line of best fit through a data set, and interpolating a value [12 marks]

need to comment here y_i is the interpolated value, more usual y_1 is the assigned value.

[11 marks]

Q5 Showing a function is a solution to a differential equation [10 marks]

All correct

[10 marks]

Q6 Finding the dot and cross product of vectors in 3D [10 marks]

All correct

[10 marks]

Q7 Finding the determinant and the inverse of a 3 x 3 matrix [10 marks]

Some parts here done twice?

[9 marks]

Q8 Solving a 3x3 system of simultaneous linear equations [12 marks] Method is correct but error in translating command to Word file Inv(A) which you used has become inv(4?), method ok and correct solution, but would have been nice to assign values to x, y and z

[9 marks]

total = 75/84, 89%

This is a very good effort Osian, and shows that you have a good grasp of the fundamentals of matlab, which can help you solve mathematical problems, and will help you as you develop your mathematical and computing knowledge.

Well done, really good effort here!

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Comment 1

d would be correct but in word it thinks its a capital.

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