

Part A (Matlab Tutorial)

Exercise 5: let $p(t) = -1 + 3t - 2t^2$ -that is, p is a polynomial. Use Matlab to compute the value of p at each of the entries of x . The first entry of this matrix should be $p(7)$ since the first entry of x is 7. The last entry of this matrix should be $p(2)$ since 2 is the last entry of x

Solution:

```
x = [7 1 8 2]
```

```
x =
```

```
7      1      8      2
```

```
p = -1+3*x-2*x.^2
```

```
p =
```

```
-78      0  -105      -3
```

Using the *polyval* function:

```
x = [7 1 8 2]
```

```
x =
```

```
7      1      8      2
```

```
p = [-2 3 -1]
```

```
p =
```

```
-2      3      -1
```

```
polyval(p,x)
```

```
ans =
```

```
-78      0  -105      -3
```

Exercise 7: Plot the curves $y = Ce^x$ for $C = 1, C = 1/2, C = 0, C = -1/2$ and $C = -1$ the range $-1 \leq x \leq 1$ all in the same figure. Add a helpful legend in your plot.

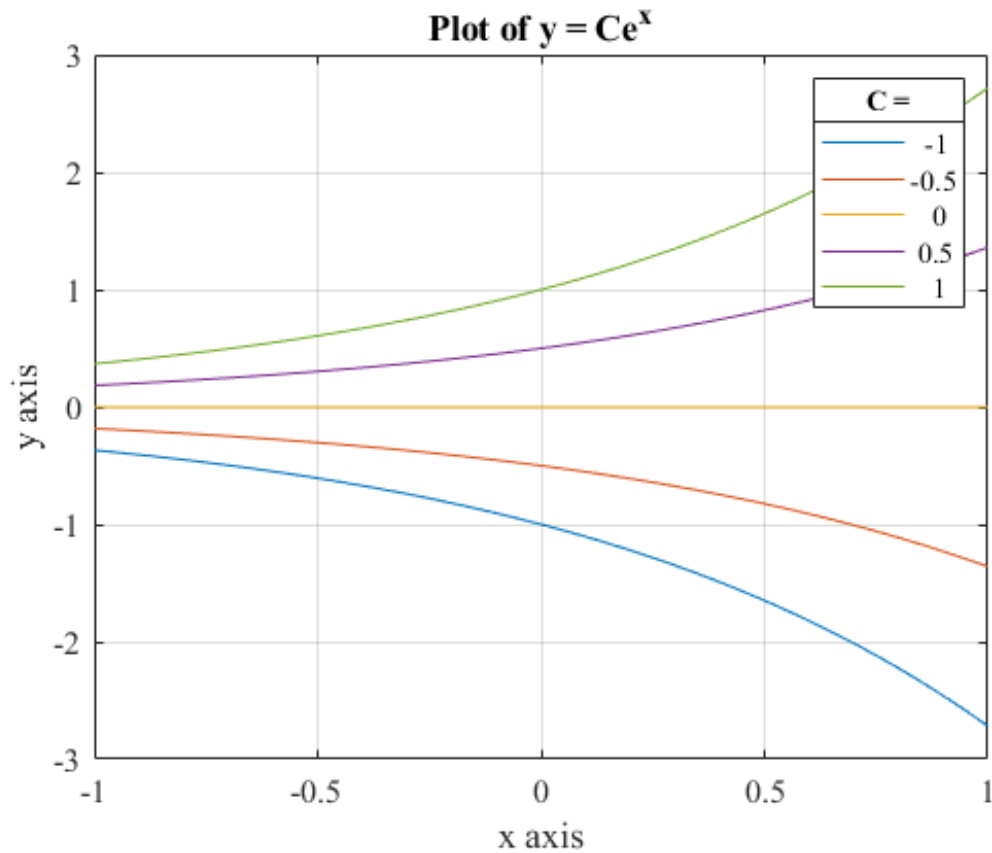
Solution:

```
c = [-1:.5:1]
```

```
c =
```

```
    -1.0000    -0.5000         0     0.5000     1.0000
```

```
x = [-1:.01:1];
y = c' .* exp(x);
plot(x,y)
legend(num2str(c'))
title(legend,'C =')
xlabel('x axis')
ylabel('y axis')
set(gca,'FontName','Times')
set(gca,'FontSize',12)
title('Plot of $y = Ce^x$')
title('Plot of y = Ce^x')
grid
```



Exercise 9: Let,

$$\text{logistic}(x) = \frac{1}{1 + e^{-x}}.$$

- Following the example from section use matlab to define a function *logistic* for this function.

Answer:

```
f = inline('(1+exp(-x)).^(-1)')
```

```
f =
```

Inline function:

```
f(x) = (1+exp(-x)).^(-1)
```

2. Verify that your function works correctly by computing $\text{logistic}(0)$, $\text{logistic}(1)$ and $\text{logistic}([0, 1])$. Do you obtain the right answers? (Hint: if you have an error when you test with vector input think about dot operators)

Answer:

`f(0)`

`ans =`

0.5000

`f(1)`

`ans =`

0.7311

`x = [0:.1:1]`

`x =`

Columns 1 through 7

	0	0.1000	0.2000	0.3000	0.4000	0.5000
0.6000						

Columns 8 through 11

0.7000	0.8000	0.9000	1.0000
--------	--------	--------	--------

`f(x)`

`ans =`

Columns 1 through 7

0.5000	0.5250	0.5498	0.5744	0.5987	0.6225
0.6457					

Columns 8 through 11

0.6682	0.6900	0.7109	0.7311
--------	--------	--------	--------

Note the `.^(-1)` notation. When applied to a vector `.^(-1)` inverts each entry individually, achieving the desired result. Also note that the notation `1./` would achieve the

same result.

3. Plot the logistic function over the range $-2 \leq x \leq 2$. Add a red square or diamond that marks the point $(1, \text{logistic}(1))$

Answer:

```
x = [-2:0.1:2];  
hold on  
plot(x, f(x))  
plot(1, f(1), 'rs')  
hold off
```

