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Homework 1

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```
clc; clear all;
format long g
```

Problem 1

```
z=[10 40 70 90 20 30 50 60];

z(1:3:7)=zeros(1,3)
z([3 4 1])=[]
```

```
z =

     0    40    70     0    20    30     0    60


z =

    40    20    30     0    60
```

Problem 2

part a

```
% i. t=1:4:25
t=linspace(1,25,7);
t
% ii. x=-11:1
x=linspace(-11,1,13);
x
```

part b

```
%i. v=linspace(-10,-8,6)
v=-10:2/5:-8;
```

```
v
%ii. r=linspace(0,1,5)
r=0:1/4:1;
r
```

```
t =

     1     5     9    13    17    21    25


x =

   -11   -10    -9    -8    -7    -6    -5    -4    -3    -2    -1     0     1


v =

  Columns 1 through 3

                     -10                      -9.6                      -9.2

  Columns 4 through 6

                    -8.8                      -8.4                        -8


r =

  Columns 1 through 3

                       0                      0.25                       0.5

  Columns 4 through 5

                    0.75                         1
```

Problem 3

given

```
t=0:0.1:1;
y=sin(pi*t);
```

a)

```
sum(t)
```

b)

```
sum(t.*y)
```

c)

```
sum(t.^2)
```

```
ans =

                          5.5


ans =

          3.15687575733752


ans =

                         3.85
```

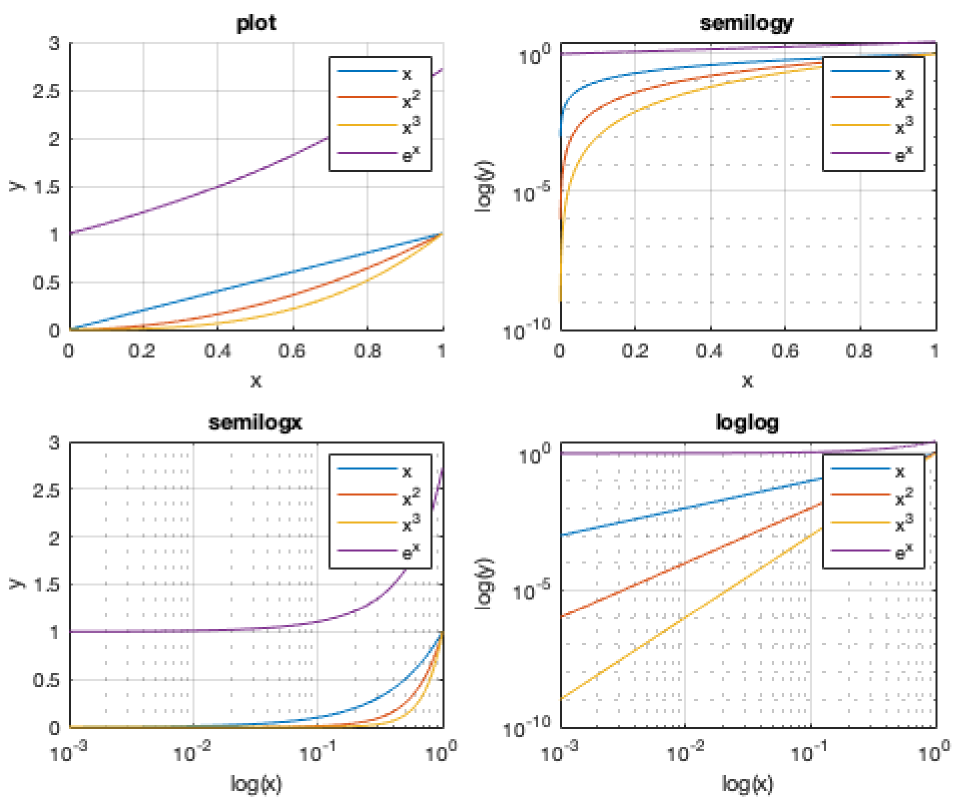
Problem 4

```
x=linspace(0,1,1000);
x2 = x.^2;
x3 = x.^3;
xexp = exp(x);

subplot(2,2,1)
hold on
plot(x,x)
plot(x,x2)
plot(x,x3)
plot(x,xexp)
hold off
grid on
legend('x','x^2','x^3','e^x')
title('plot')
xlabel('x')
ylabel('y')

subplot(2,2,2)
semilogy(x,x,x,x2,x,x3,x,xexp)
grid on
legend('x','x^2','x^3','e^x')
title('semilogy')
xlabel('x')
ylabel('log(y)')

subplot(2,2,3)
semilogx(x,x,x,x2,x,x3,x,xexp)
grid on
legend('x','x^2','x^3','e^x')
title('semilogx')
xlabel('log(x)')
ylabel('y')

subplot(2,2,4)
```

```
loglog(x,x,x,x2,x,x3,x,xexp)
grid on
legend('x','x^2','x^3','e^x')
title('loglog')
xlabel('log(x)')
ylabel('log(y)')
```

Advantages and disadvantages of using plot, semilogy, semilogx, loglog:

- Plot: plot is used more widely and can easily describe the behavior of polynomic functions. It is better to use a logarithmic function for exponential and quick growing functions.
- semilogy: works well with functions that grow quickly in the y axis, otherwise it could cause trouble to understand these graphs.
- semilogx: works well with functions that grow quickly in the x axis, otherwise it could cause trouble to understand these graphs.
- loglog: works well with functions that grow quickly in both the x and y axis. yields linear results that are easy to understand. However, it does not give too much of a description of the function's behavior.



problem 5

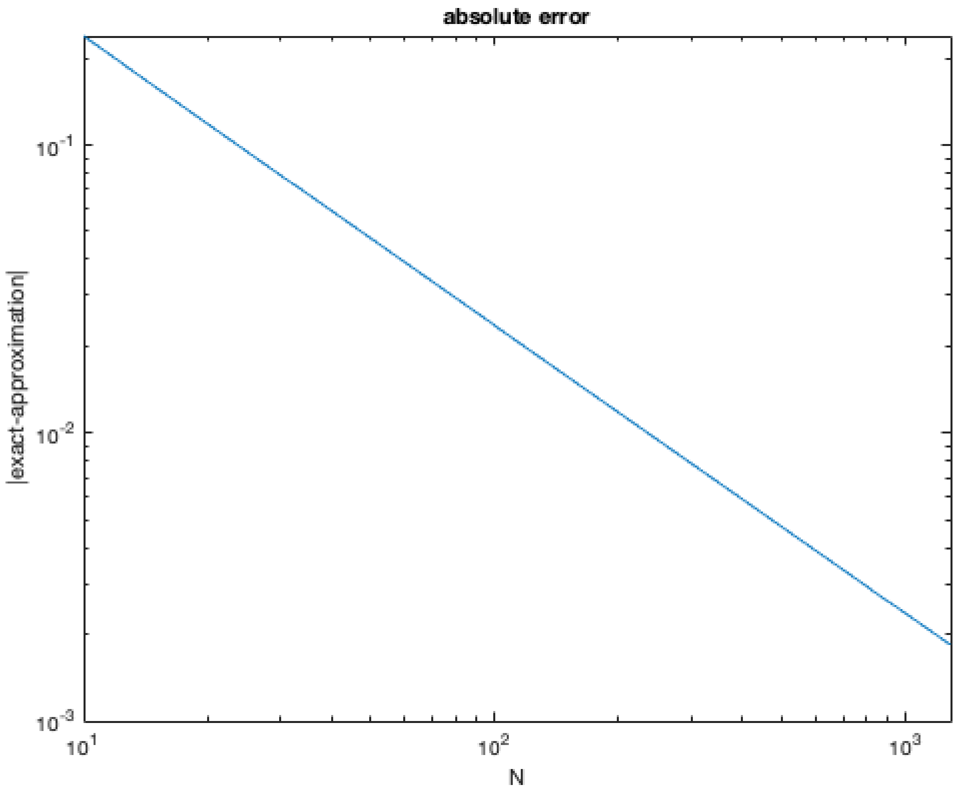
```
%%%part a
%anonymous function for sin(x)

sin=@(x) sin(x);

% calls the function my_mean to estimate the integral between 0 and 2
my_mean(@sin, 0, 2, 100)
```

```
%%%part b
% we create the function my_fun that only receives a vector x and returns
% xe^x

%%%part c
% we want to calculate the integral from -1 to 1 of xe^x using
%N = 10, 20, 40, 80, 160, 320, 640, and 1280

N=[10, 20, 40, 80, 160, 320, 640, 1280];
solutions_vector = zeros(1,length(N));

for i=1:length(N)
    solutions_vector(i)=my_mean(@my_fun, -1, 1, N(i));
end

exact_solution = 2/exp(1);
absolute_error=abs(exact_solution - solutions_vector);
```

As N increases the error starts to decrease and the solutions gets closer to the exact solution

```
figure()
loglog(N,absolute_error);
title('absolute error');
xlabel('N');
ylabel('|exact-approximation|');

%%%part d
% notice how as the N increases the absolut errore decreases.
% also notice that the approximation gets closer and closer to 2/e

fprintf(' N \t approximation \t absolute error \n');
fprintf('%4.0f \t %4.5f \t %4.5f\n',[N;solutions_vector;absolute_error]);
```

```
ans =

         1.42711587058324

 N       approximation    absolute error
  10     0.49694          0.23882
  20     0.61707          0.11869
  40     0.67668          0.05908
  80     0.70630          0.02946
 160     0.72105          0.01471
 320     0.72841          0.00735
 640     0.73209          0.00367
1280     0.73392          0.00184
```



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