Midterm II

Table of Contents

Lucas Gobaco

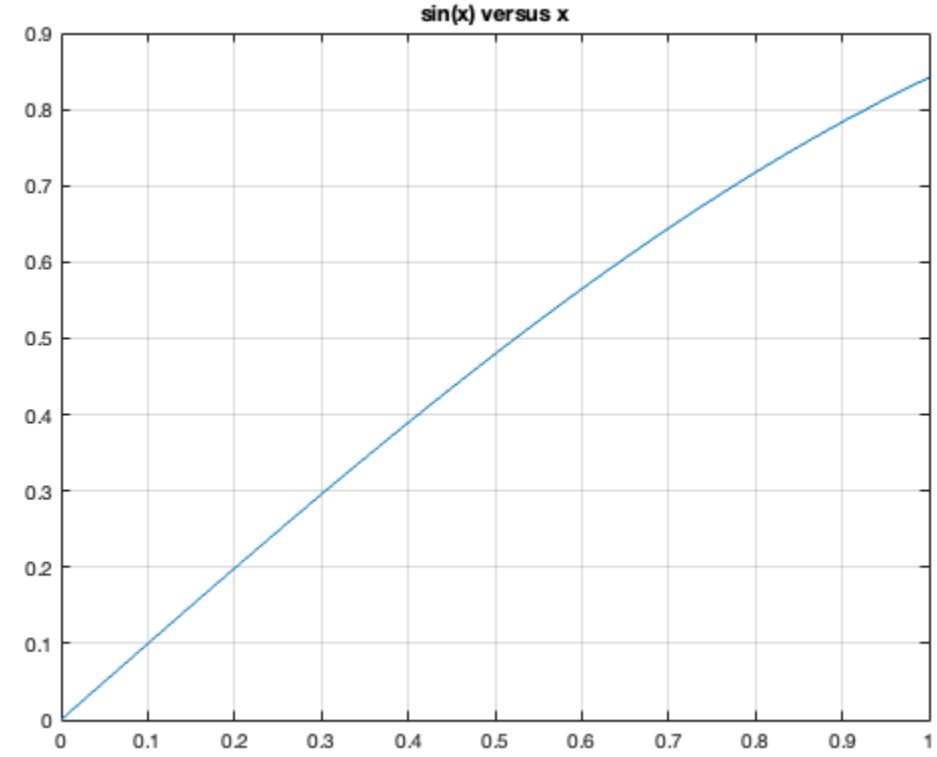
ENGI-111-01

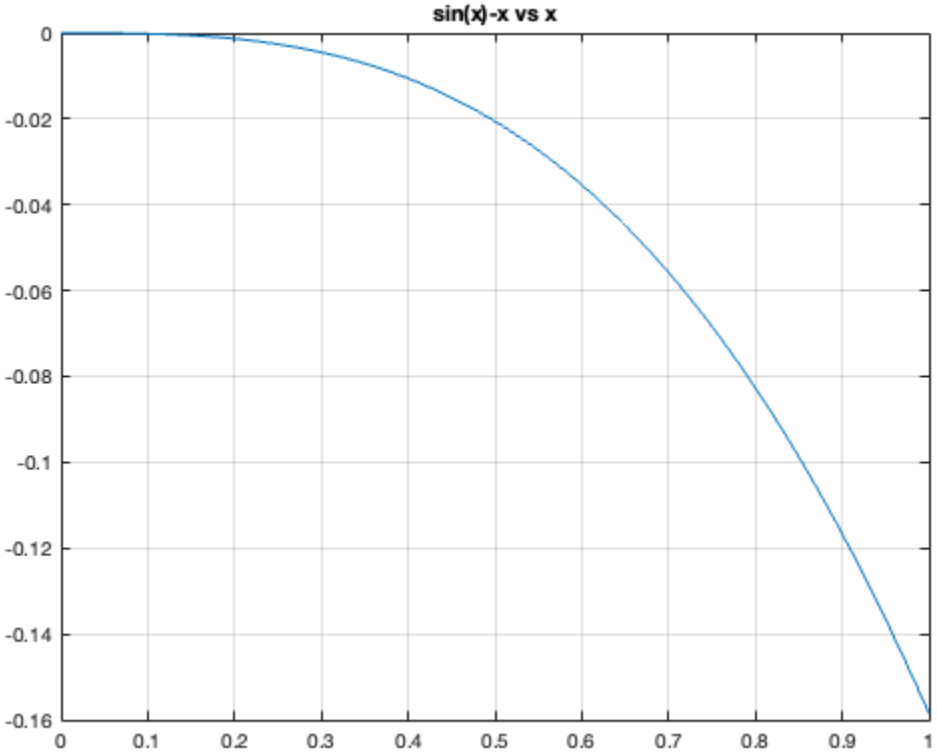
Mahnaz Firouzi

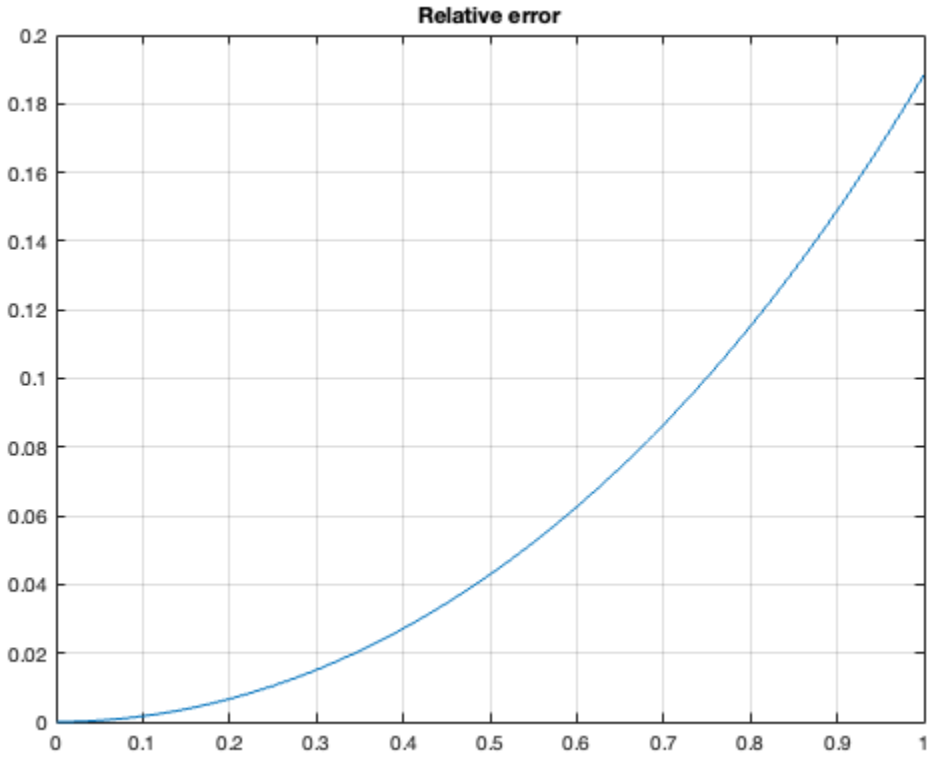
23 April 2024

Question 1

```
% Plot 1
x = 0:.001:1;
plot(x, sin(x))
title('sin(x) versus x')
grid on
% Plot 2
figure
plot(x, (sin(x))-x);
title('sin(x)-x vs x')
grid on
figure
% Plot 3
plot(x, abs(sin(x)-x)./sin(x))
title('Relative error')
grid on
er = abs(sin(x)-x)./sin(x);
% From the relative error plot, we can see that x<.6 is accurate within 5
percent
```


sin(x) versus x
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

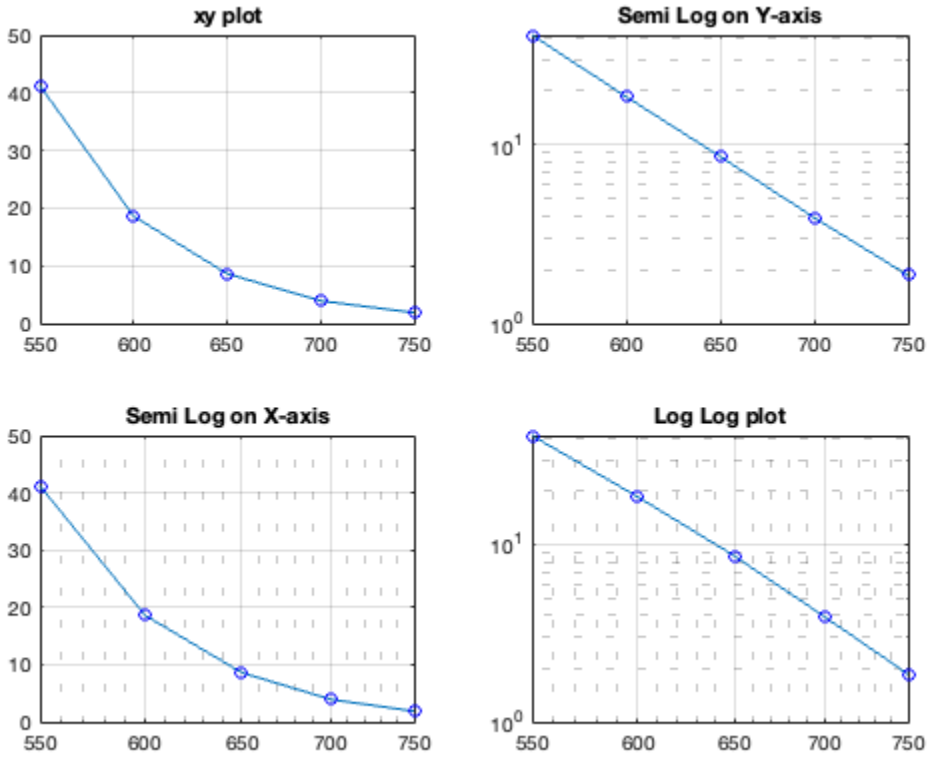

sin(x)-x vs x
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-0.14
-0.16
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1



Question 2

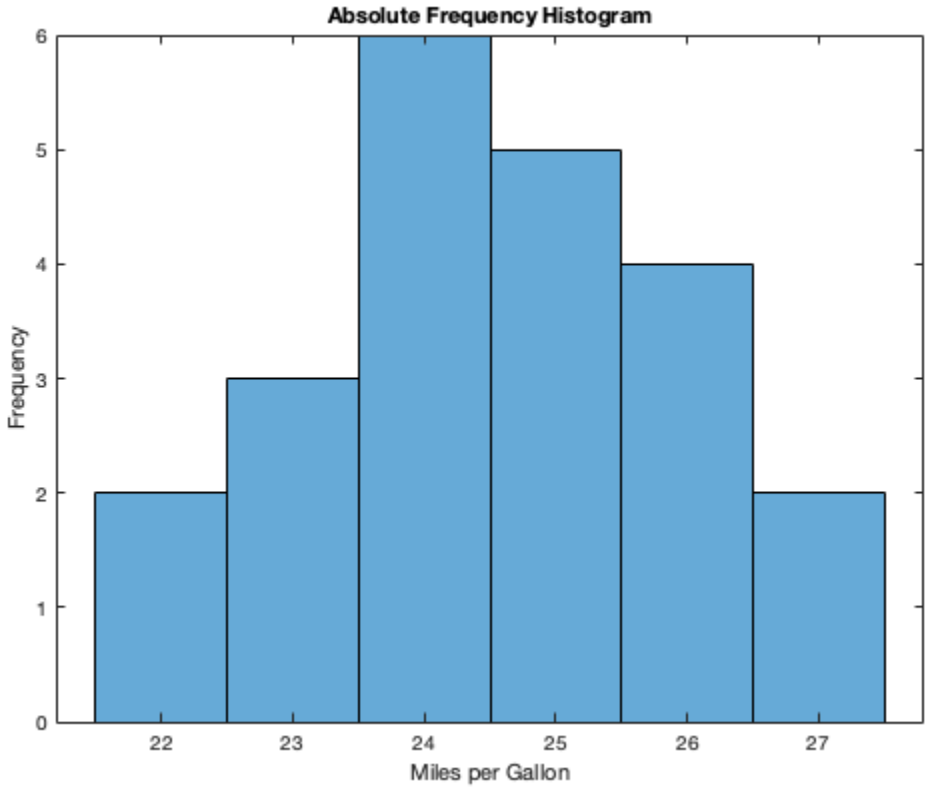
```
% a.
x = [25 30 35 40 45];
y = [5 260 480 745 1100];

subplot (2, 2, 1)
plot (x, y, x, y, 'bo')
grid on
title ('xy plot')
subplot (2, 2, 2)
semilogy (x, y, x, y, 'bo')
grid on
title ('Semi Log on Y-axis')
subplot (2, 2, 3)
semilogx (x, y, x, y, 'bo')
title ('Semi Log on X-axis')
grid on
subplot (2, 2, 4)
loglog (x, y, x, y, 'bo')
title ('Log Log plot')
grid on

% b.
x = [2.5 3 3.5 4 4.5 5 5.5 6 7 8 9 10];
```

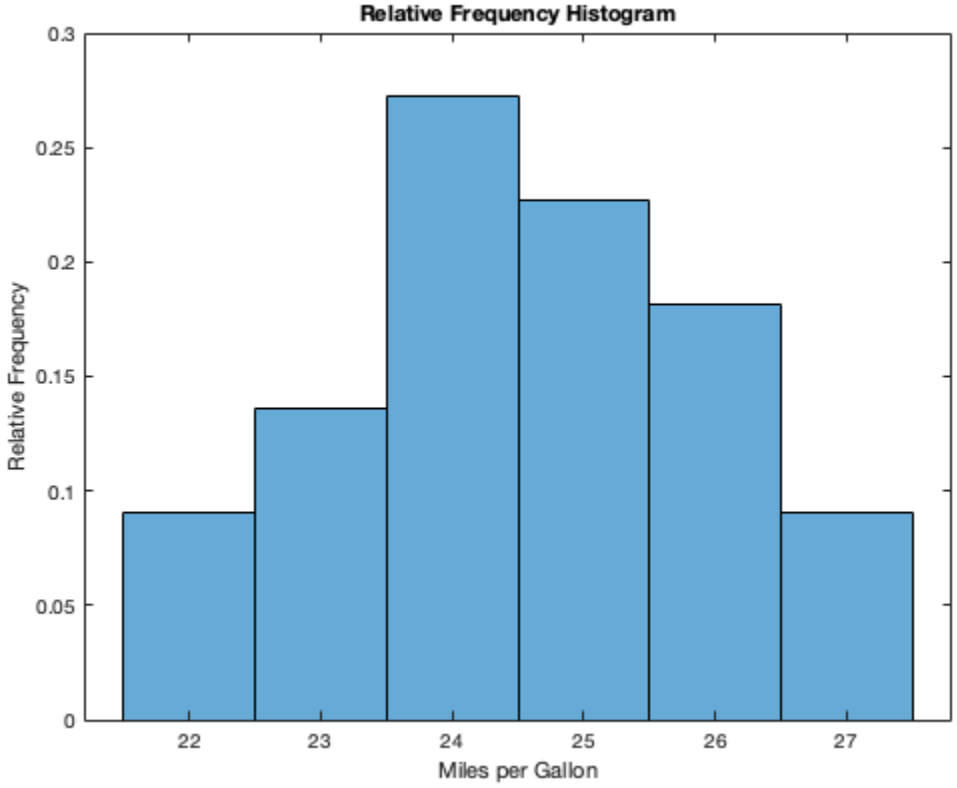
```
y = [1500 1220 1050 915 810 745 690 620 520 480 410 390];

subplot (2, 2, 1)
plot (x, y, x, y, 'bo')
grid on
title ('xy plot')
subplot (2, 2, 2)
semilogy (x, y, x, y, 'bo')
grid on
title ('Semi Log on Y-axis')
subplot (2, 2, 3)
semilogx (x, y, x, y, 'bo')
title ('Semi Log on X-axis')
grid on
subplot (2, 2, 4)
loglog (x, y, x, y, 'bo')
title ('Log Log plot')
grid on

% c.
x = [550 600 650 700 750];
y = [41.2 18.62 8.62 3.92 1.86];

subplot (2, 2, 1)
plot (x, y, x, y, 'bo')
grid on
title ('xy plot')
subplot (2, 2, 2)
semilogy (x, y, x, y, 'bo')
grid on
title ('Semi Log on Y-axis')
subplot (2, 2, 3)
semilogx (x, y, x, y, 'bo')
title ('Semi Log on X-axis')
grid on
subplot (2, 2, 4)
loglog (x, y, x, y, 'bo')
title ('Log Log plot')
grid on
```



Question 3

```
data = [23, 25, 26, 25, 27, 25, 24, 22, 23, 25, 26, 26, 24, 24, 22, 25, 26,
24, 24, 24, 27, 23];

% absolute frequency histogram
figure;
histogram(data, 'BinMethod', 'integers', 'Normalization', 'count');
title('Absolute Frequency Histogram');
xlabel('Miles per Gallon');
ylabel('Frequency');

% relative frequency histogram
figure;
histogram(data, 'BinMethod', 'integers', 'Normalization', 'probability');
title('Relative Frequency Histogram');
xlabel('Miles per Gallon');
ylabel('Relative Frequency');
```


Absolute Frequency Histogram
Frequency
Miles per Gallon
0
1
2
3
4
5
6
22
23
24
25
26
27


Relative Frequency Histogram
Relative Frequency
Miles per Gallon
0
0.05
0.1
0.15
0.2
0.25
0.3
22
23
24
25
26
27

Question 4

```
time = [1:4 6:8 10:12];
temp = [10 9 18 24 21 20 18 15 13 11];
interp1(time, temp, [5 9])
```

```
ans =

   22.5000   16.5000
```

Question 5

```
% a.
t = 0:0.01:3;
xA = 6*t - 10;
yA = 25*t.^2 - 60*t + 100;
xB = 5*t - 10;
yB = 5*t + 10;
d2 = (xA - xB).^2 + (yA - yB).^2;
minimum = 1e+14;
for k = 1:length(t)
    if d2(k) < minimum
        minimum = d2(k);
        tmin = t(k);
    end
end
disp('The minimum distance is: ')
disp(sqrt(minimum))
disp('and it occurs at t = ')
disp(tmin)

% b.
t = 0:0.01:3;
xA = 6*t - 10;
yA = 25*t.^2 - 60*t + 100;
xB = 5*t - 10;
yB = 5*t + 10;
d2 = (xA - xB).^2 + (yA - yB).^2;
[minimum, n] = min(d2);
disp('The minimum distance is: ')
disp(sqrt(minimum))
disp('and it occurs at t = ')
disp(t(n))
```

```
The minimum distance is:
   47.7677

and it occurs at t =
    1.3000

The minimum distance is:
```

```
   47.7677

and it occurs at t =
    1.3000
```

Published with MATLAB® R2023b