ECE 111 - Homework #2

Week #2: Matlab and Trigonometry Due 8am, Tuesday, January 25th

Please submit as a Word or pdf file and email to Jacob_Glower@yahoo.com with header ECE 111 HW#2

Plot the following functions in Matlab

1) sine vs. cosine

```
Q = [0:0.01:1]' * 2*pi;

for i=1:1000
   X = cos(Q);
   Y = sin(Q + 0.01*i);
   plot(X,Y);
   xlim([-1.2,1.2]);
   ylim([-1.2,1.2]);
   pause(0.01);
   end
```

2) Lissajous Figure:

```
Q = [0:0.01:1]' * 2*pi;

for i=1:1000
   X = cos(Q);
   Y = sin(3*Q + 0.01*i);
   plot(X,Y);
   xlim([-1.2,1.2]);
   ylim([-1.2,1.2]);
   pause(0.01);
   end
```

3) Linear Spiral: $r = \theta$

```
Q = [0:0.01:8]' * 2*pi;
for i=1:1000
   r = Q;
   X = r .* cos(Q + 0.05*i);
   Y = r .* sin(Q + 0.05*i);
   plot(X,Y);
   xlim([-30,30]);
   ylim([-30,30]);
   pause(0.01);
   end
```

4) Log Spiral: $r = \ln(\theta + 1)$

```
Q = [0:0.01:8]' * 2*pi;
for i=1:1000
   r = log(Q + 1);
   X = r .* cos(Q + 0.05*i);
   Y = r .* sin(Q + 0.05*i);
   plot(X,Y);
   xlim([-5,5]);
   ylim([-5,5]);
   pause(0.01);
   end
```

f(x) = 0: Newton's Method

5) Use Newton's method to find the solutions to problem #3 for homework set #1

$$y = x \cdot \cos(2x) \quad \text{and} \quad y = x^2 - 1$$

or

$$x \cdot \cos(2x) - (x^2 - 1) = 0$$

f(x) = 0: Shoot Game:

Pick a random number from 50 to 100 for your target.

Pick a random number from 30 to 70 for your firing angle

6) Use trial and error to find the initial velocity (X) to fire a tennis ball to hit the target (result is zero)

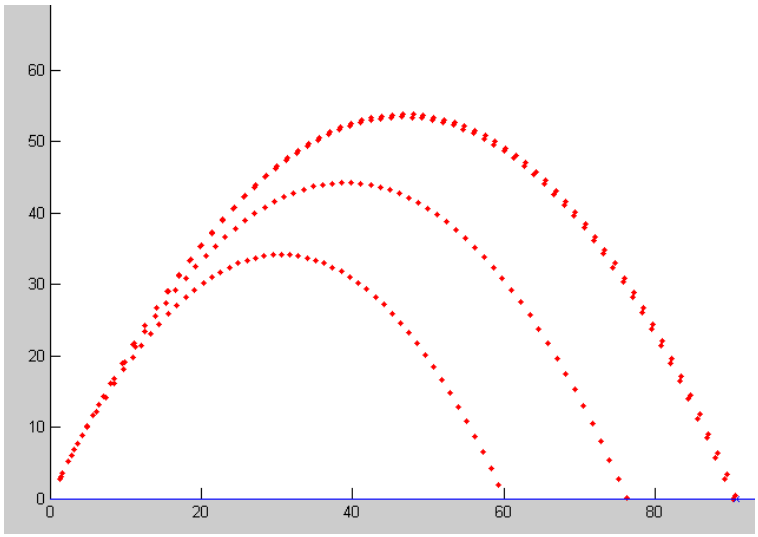
```
>> Target = 50*rand + 50
Target =   90.7362

>> Angle = 50*rand + 20
Angle =   65.2896

>> Shoot(30, Angle, Target)
ans =   30.6515

>> Shoot(50, Angle, Target)
ans =  -28.2262

>> Shoot(40, Angle, Target)
ans =   -0.9533
```



7) Repeat using Newton's method to find the initial velocity (X) to fire the tenis ball to hit the target

```
>> X1 = 30;
>> Y1 = Shoot(X1, Angle, Target)
Y1 =   30.6515

>> X2 = 35;
>> Y2 = Shoot(X2, Angle, Target)
Y2 =   14.5376

>> X3 = X2 - (X2-X1)/(Y2-Y1)*Y2
X3 =   39.5109

>> Y3 = Shoot(X3, Angle, Target)
Y3 =    0.5175

>> X4 = X3 - (X3-X2)/(Y3-Y2)*Y3
X4 =   39.6774

>> Y4 = Shoot(X4, Angle, Target)
Y4 =    0.0156
```