

ECE 111 - Homework #2

Week #2: Matlab and Trigonometry Due 11am, Tuesday, September 6th

Plot the following functions in Matlab

1) $r = \sin(\theta + 2)$

```
q = [0:0.01:1]' * 2*pi;  
r = sin(q + 2);  
x = r .* cos(q);  
y = r .* sin(q);  
plot(x,y)
```

2) $r = \sin(3\theta)$

3) $r = \cos(4\theta) \cdot \sin(2\theta)$

4) Lissajous Figure:

- $x = \cos \theta$
- $y = \sin(4\theta)$

```
Q = [0:0.001:1]' * 2*pi;  
  
for i=1:1000  
    X = cos(Q);  
    Y = sin(4*Q + 0.01*i);  
    plot(X,Y);  
    xlim([-1.2,1.2]);  
    ylim([-1.2,1.2]);  
    pause(0.01);  
end
```

f(x) = 0: Newton's Method

5) Use Newton's method to find the solutions to problem #4 for homework set #1

$$y = (x-2)(x)(x+2)$$

$$y = \frac{x}{2} - 2$$

or

$$f(x) = (x-2)(x)(x+2) - \left(\frac{x}{2} - 2\right) = 0$$

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 tennis 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
```

