ECE 111 - Homework #2

Week #2: Matlab and Trigonometry

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 for $0 < \theta < 4\pi$

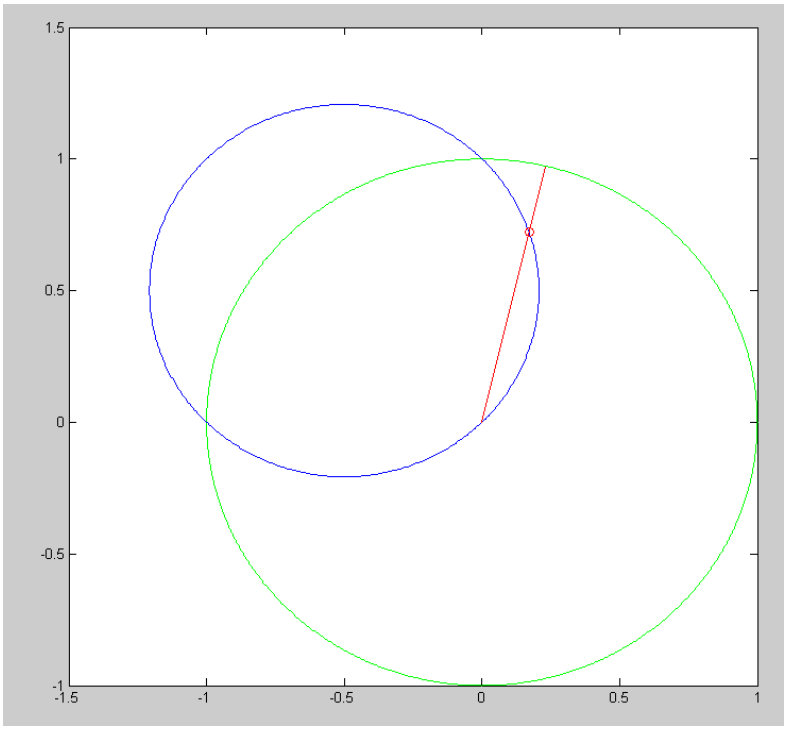
1) $r = \sin\theta - \cos\theta$

```
q = [0:0.001:2]' * 2*pi;
r = 1;
x1 = r .* cos(q);
y1 = r .* sin(q);

r = sin(q) - cos(q);

x2 = r .* cos(q);
y2 = r .* sin(q);

for i=1:length(q)
   Q = q(i);
   R = r(i);
   X = R * cos(Q);
   Y = R * sin(Q);
   plot(x1,y1,'g-',x2,y2,'b-',X,Y,'ro',[0,cos(Q)],[0,sin(Q)],'r-');
   pause(0.01);
   end
```



2) Clover:

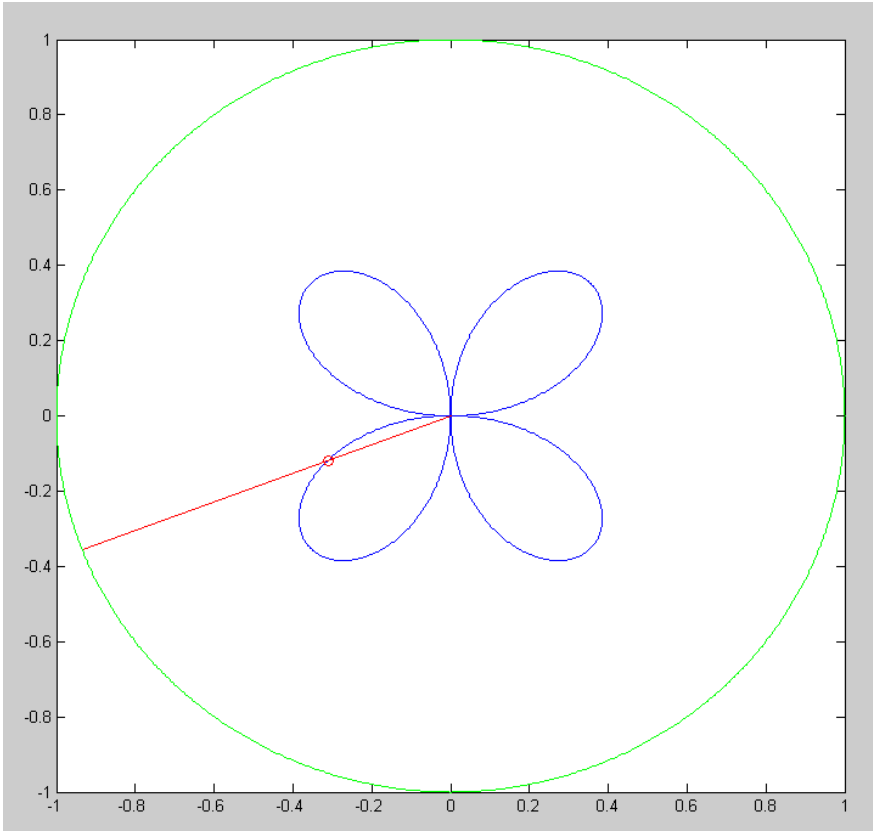
$$r = \sin(\theta) \cdot \cos(\theta)$$

```
q = [0:0.001:2]' * 2*pi;
r = 1;
x1 = r .* cos(q);
y1 = r .* sin(q);

r = sin(q) .* cos(q);

x2 = r .* cos(q);
y2 = r .* sin(q);

for i=1:length(q)
   Q = q(i);
   R = r(i);
   X = R * cos(Q);
   Y = R * sin(Q);
   plot(x1,y1,'g-',x2,y2,'b-',X,Y,'ro',[0,cos(Q)],[0,sin(Q)],'r-');
   pause(0.01);
   end
```



3) Butterfly

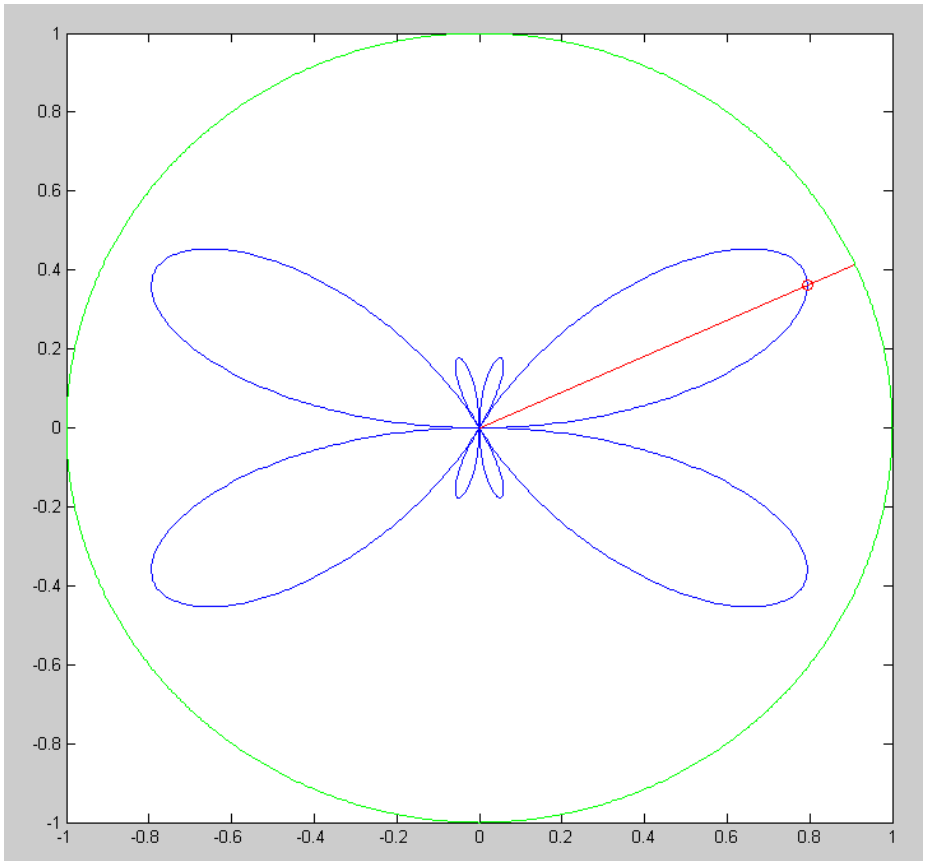
$$r = \sin(3\theta) \cdot \cos(\theta)$$

```
q = [0:0.001:2]' * 2*pi;
r = 1;
x1 = r .* cos(q);
y1 = r .* sin(q);

r = sin(3*q) .* cos(q);


x2 = r .* cos(q);
y2 = r .* sin(q);

for i=1:length(q)
   Q = q(i);
   R = r(i);
   X = R * cos(Q);
   Y = R * sin(Q);
   plot(x1,y1,'g-',x2,y2,'b-',X,Y,'ro',[0,cos(Q)],[0,sin(Q)],'r-');
   pause(0.01);
   end
```



4) Daisy

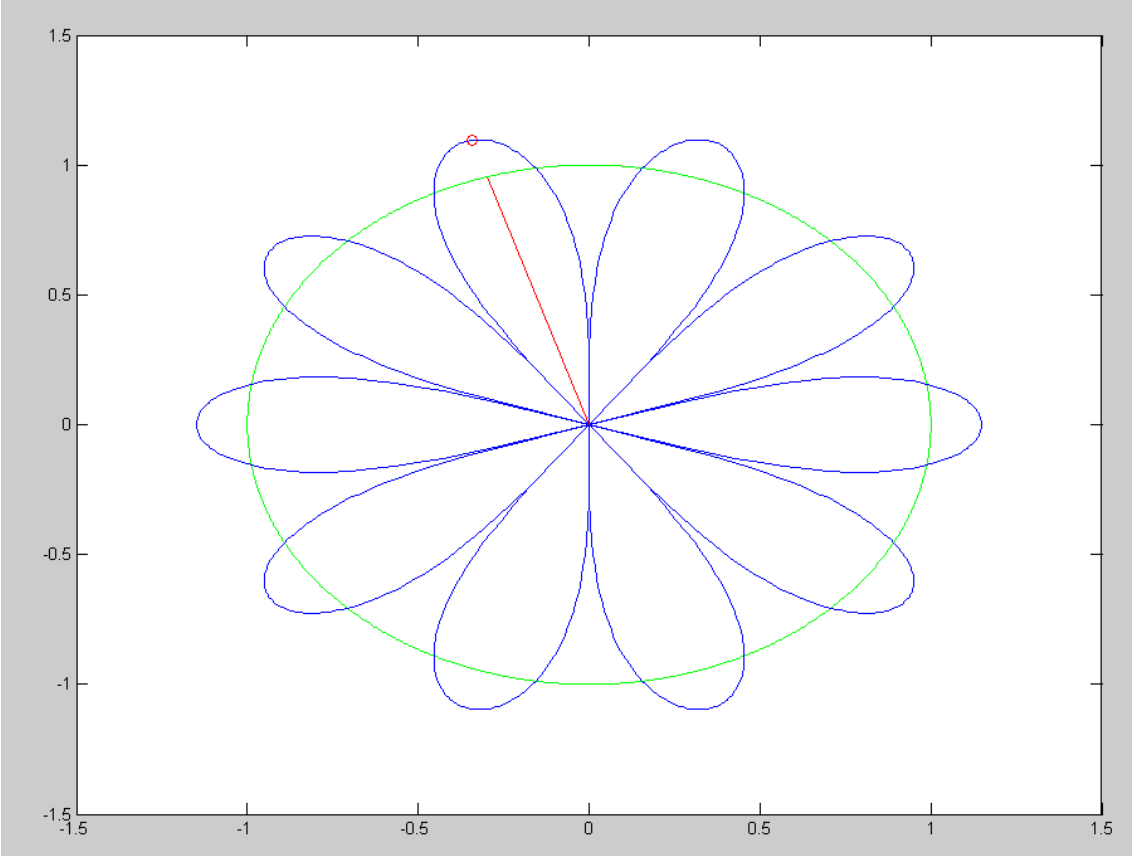
$$r = (1 + \cos(10\theta))^{0.2}$$

```
q = [0:0.001:2]' * 2*pi;
r = 1;
x1 = r .* cos(q);
y1 = r .* sin(q);

r = ( 1 + cos(10*q)) .^ 0.2;


x2 = r .* cos(q);
y2 = r .* sin(q);

for i=1:length(q)
   Q = q(i);
   R = r(i);
   X = R * cos(Q);
   Y = R * sin(Q);
   plot(x1,y1,'g-',x2,y2,'b-',X,Y,'ro',[0,cos(Q)],[0,sin(Q)],'r-');
   pause(0.01);
   end
```



5) Spiral

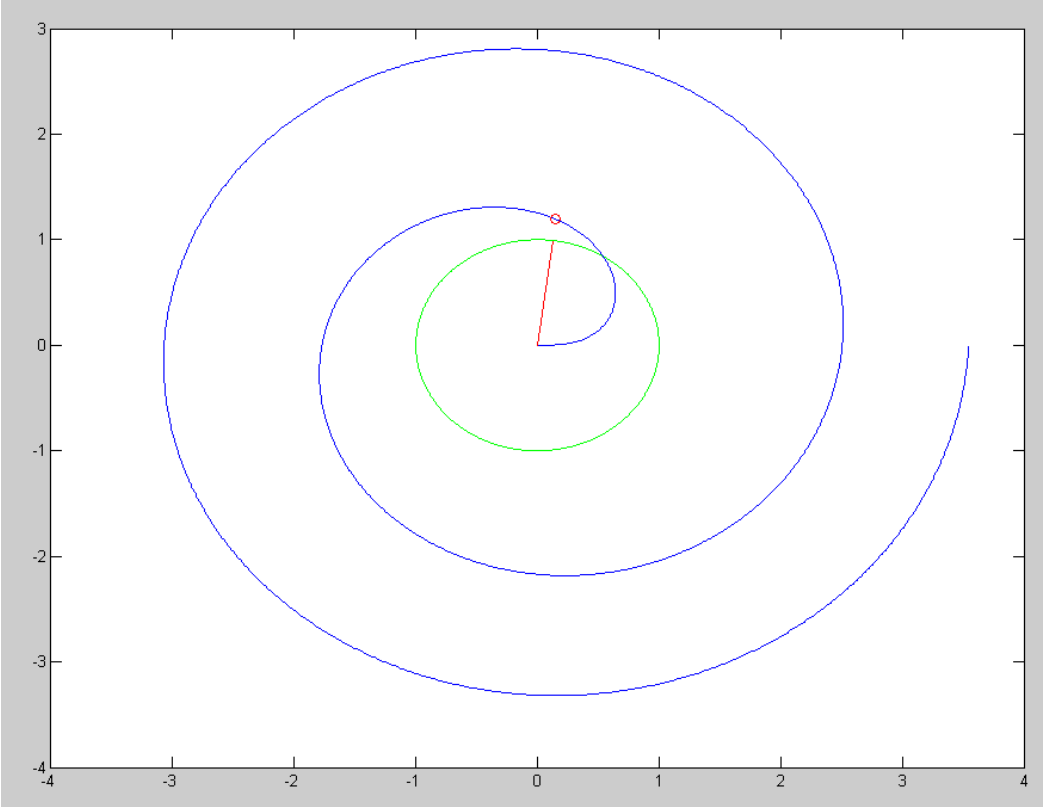
$$r = \sqrt{\theta}$$

```
q = [0:0.001:2]' * 2*pi;
r = 1;
x1 = r .* cos(q);
y1 = r .* sin(q);

r = (q) .^ 0.5;

x2 = r .* cos(q);
y2 = r .* sin(q);

for i=1:length(q)
   Q = q(i);
   R = r(i);
   X = R * cos(Q);
   Y = R * sin(Q);
   plot(x1,y1,'g-',x2,y2,'b-',X,Y,'ro',[0,cos(Q)],[0,sin(Q)],'r-');
   pause(0.01);
   end
```



f(x) = 0: Shoot Game:

6) Pick a random number from 50 to 100. Determine the angle and velocity required to hit a target that many meters out with a tennis ball. For each iteration, explain how you came up with the next guess for angle and velocity.

Using Newton's method, the next guess (X3) is determined by finding the zero crossing based upon the previous two guesses:

```
> X1 = 15;
>> Y1 = Shoot(X1, 50, 90)
Y1 =  -67.9869

>> X2 = 20;
>> Y2 = Shoot(X2, 50, 90)
Y2 =  -51.9500

>> X3 = X2 - (X2-X1)/(Y2-Y1)*Y2
X3 =   36.1970

>> Y3 = Shoot(X3, 50, 90)
Y3 =   12.4197

>> X4 = X3 - (X3-X2)/(Y3-Y2)*Y3
X4 =   33.0719

>> Y4 = Shoot(X4, 50, 90)
Y4 =   -0.2068

>> X5 = X4 - (X4-X3)/(Y4-Y3)*Y4
X5 =   33.1231

>> Y5 = Shoot(X5, 50, 90)
Y5 =    0.0022
```