

## MATH495.3 (CRN 13695)

### Laboratory # 3 : Darts

Using the code darts.m below, answer the questions below in a word document. Please copy plots into the document.

```
clear
close all
clc

rand('seed',.123456)
NumberInside = 0;
Estimate = zeros(500,1);
for k=1:500
    x = -1+2*rand(100,1);
    y = -1+2*rand(100,1);
    NumberInside = NumberInside + sum(x.^2 + y.^2 <= 1);
    Estimate(k) = (NumberInside/(k*100))*4;
end
plot(Estimate)
title('Your title');
xlabel('Your xlabel')
ylabel('Your ylabel')
```

### Questions

1. In this dart throwing experiment, what is the random variable?
2. What is the sample space?
3. What is the probability distribution function (pdf) from which our random values  $x$  and  $y$  are chosen?
4. What is the cumulative distribution function (cdf) from which  $x$  and  $y$  are chosen?
5. Give a histogram of the  $x$  values for a single simulation and one including **all** the simulations. Be sure to label your axes (and title)! Is this similar to what histograms of  $y$  should look like?

6. Finally, what is the program darts.m doing? What is the output converging to (numerically and conceptually)?

7. *Extra Credit* Run the following MATLAB code with  $n = 100000$ . Explain the histogram.

```
function radius_histogram(n)
```

```
x=rand(n,1);  
y=rand(n,1);  
r=sqrt(x.^2+y.^2);  
hist(r,50)
```

```
end
```