# Math 2311

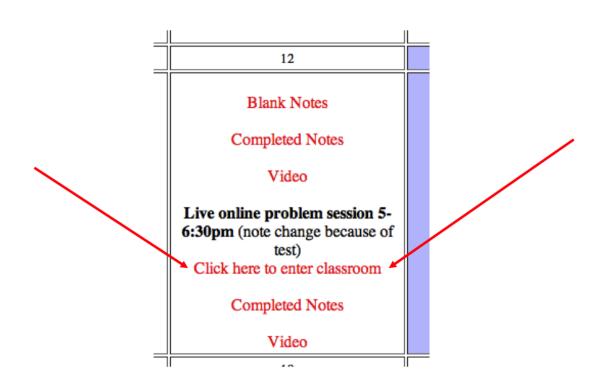
Bekki George – bekki@math.uh.edu
Office Hours: MW 11am to 12:45pm in 639 PGH
Online Thursdays 4-5:30pm
And by appointment

Class webpage: <a href="http://www.math.uh.edu/~bekki/Math2311.html">http://www.math.uh.edu/~bekki/Math2311.html</a>

TEST 1 BEGINS THURSDAY 2/13!!!! MAKE SURE YOU HAVE REGISTERED AND RECORDED YOUR TIME. IF YOU ARE LATE, THEY WILL NOT ADMIT YOU.

# Live online problem session 5-6:30pm TONIGHT!!!

(note change because of test)
Use the link on the class webpage to join.



# ANY OTHER QUESTIONS OVER TEST 1 MATERIAL???????

Among 17 electrical components exactly 4 are known not to function properly. If 8 components are randomly selected, find the following probabilities: n(S) = 17

- (i) The probability that all selected components function properly.
- (ii) The probability that exactly 3 are defective.
- (iii) The probability that at least 1 component is defective.

- b) (i) 0.0529 (ii) 0.2118 (iii) 0.9471
- c) (i) 0.0529 (ii) 0.2118 (iii) 0.2824
- (i) 0.5059 (ii) 0.0529 (iii) 0.2824
  - e) (i) 0.0529 (ii) 0.2824 (iii) 0.9471

$$(i)$$
  $\frac{13 c_8}{17 c_8} = \frac{1287}{24310}$ 

$$\frac{11^{13} \cdot 13^{13} \cdot 13$$

M- math - PRB-nC+

Choose (17,8)

- 24310

et least | 
$$P(X \ge 1) = 1 - P(X < 1) = 1 - P(x = 0)$$

at least 2 0 1 2 3 4 5 ]
$$P.(x \ge 2) = [-[P(x=0) + P(x=1)]$$

Discrete R.V.

$$P(X < a) = P(X \le a - 1)$$

$$P(X > a) = | -P(X \le a) |$$

$$P(X > a) = | -P(X \le a - 1)$$

$$P(X \ge a) = | -P(X \le a - 1)$$

$$P(A \le X \le b) = P(X \le b) - P(X \le a - 1)$$

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$$P(A \le A \le b) = P(A \le b) - P(A \le a - 1)$$

Binomial p=prob. of success, n= number of trials

 $P(x \le a) = binomedf(n,p,a)$  pbinom(a,n,p)  $P(x > a) = 1 - P(x \ge a)$  P(x = a) = binompdf(n,p,a)dbinom(a,n,p) Geometric #= prob. of success

(no n)

D(v)

 $P(X \le a) = geometcdf(p, a)$  pgeom(a-1, p) P(X = a) = geometpdf(p, a)Ageom(a-1, p)

#### WOFK.

#### Question 13

Which statement is not true for a binomial distribution with n = 10 and p = 1/20?

a) The probability that x equals 1 is 0.3151

- P(x=1) = mnmpdf(10, 1/20, 1)uals 0.5000 P(x=.5)? error The highest probability occurs when x equals 0.5000
- c) The standard deviation is 0.6892
- d) The number of trials is equal to 10
- The mean equals  $0.5000 \quad \bigcap \quad \rho = 5$
- f) None of the above

P(at least 2 out of 4 are white)= 
$$\frac{1}{21C_4}$$
P( $x \ge 2$ ) =  $|-P(x \ge 1)$ 

$$P(X=1) = \frac{12C_1' \cdot 4^C_3}{3_1 \cdot C_4}$$
  
 $P(X=0) = \frac{9C_4}{3}$ 

#### Question 14

In testing a new drug, researchers found that 2% of all patients using it will have a mild side effect. A random sample of 5 patients using the drug is selected.

- (i) Find the probability that none will have this mild side effect.
- (ii) Find the probability that at least one will have this mild side effect.

binomial 
$$P = .02$$
 (same for each trial)

 $1 = 5$  (number of trials fixed each trial independent

i)  $P(X = 0) = binompdf(5,.02,0)$ 
 $1 + binom(0,5,.02) = .9039$ 

a)  $P(X = 1) = 1 - .9039$ 

#### Math 2311

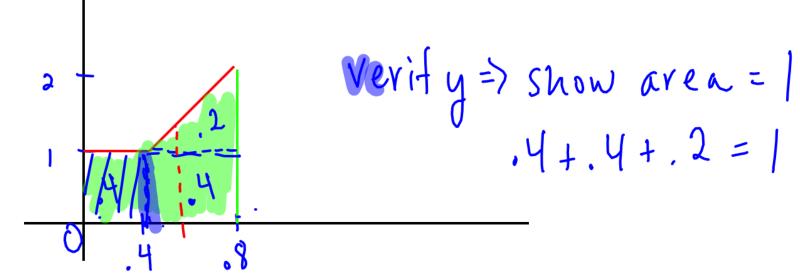
Sections 4.1, 4.2 and Review for Test 1 (If you have more questions)

### 4.1 - Density Curves

A *density curve* is a graph whose area between it and the x-axis is equal to one. These graphs come is a variety of shapes but the most familiar "normal" graph is bell shaped. The area under the curve in a range of values indicates the proportion of values in that range.

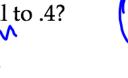
Example: Thing about a density curve that consists of two line segments. The first goes from the point (0, 1) to the point (.4, 1). The second goes from (.4, 1) to (.8, 2) in the xy plane.

Sketch:



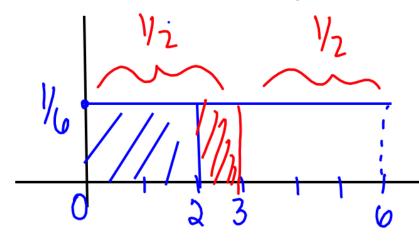
What percent of observations fall below .4? 
$$P(\chi \angle .4) = .4$$

What percent of observations lie between .4 and .8? 
$$p(44444) = 6$$



Example: Consider a uniform density curve defined from x = 0 to x = 6.

Sketch:



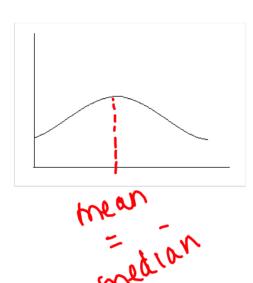
What percent of observations fall below 2?

What percent of observations lie between 2 and 3?

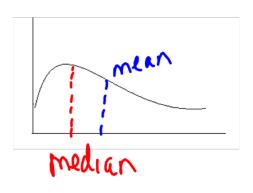
Find the median.

## Skewness and curves:

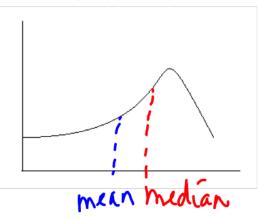
Bell Shaped (normal)



Skewed Right



Skewed Left



#### 4.2 - The Normal Distribution

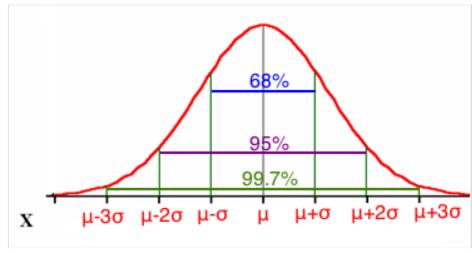
A density curve that is symmetric, single peaked and bell shaped is called a **normal distribution**.

The normal distribution with mean  $\mu$  and standard deviation  $\sigma$  is represented by  $N(\mu, \sigma)$ .

#### The Empirical Rule:

The Empirical Rule states if a distribution has a normal distribution,

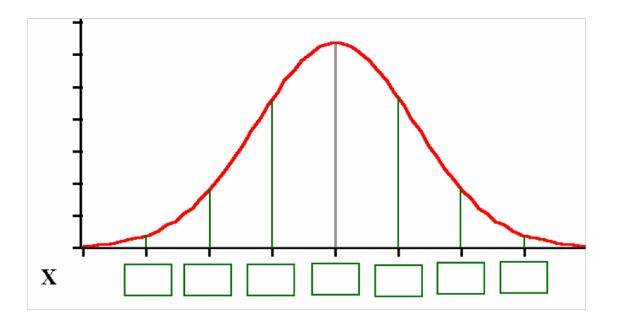
- 1. Approximately 68% of all observations fall within one standard deviation of the mean.
- 2. Approximately 95% of all observations fall within two standard deviations of the mean.
- 3. Approximately 99.7% of all observations fall within three standard deviations of the mean.



#### Example:

The length of time needed to complete a certain test is normally distributed with mean 60 minutes and standard deviation 10 minutes.

What is the probability that someone will take between 40 and 80 minutes to complete the test? Sketch the distribution and shade in the area in question.



Find the interval that contains the middle 68% of completion times for all people taking the test.

What percent of people take more than 80 minutes to complete the test?

What if our values are not exactly within one, two or three standard deviations from the mean? Probabilities for these can still be found a number of ways, one of which we will explore in the next section. Using R, the probability can be found with the command pnorm(X,  $\mu$ ,  $\sigma$ ). Note that the command in R only gives the probability that X is less than  $\epsilon$  given value. If we need to find the probability that X is greater than the given value, we will need to subtract the answer from 1.

With the TI-83 and TI-84 calculator, the command is normalcdf(lower\_limit, upper\_limit,  $\mu$ ,  $\sigma$ ).

Continuing the example above, What is the probability that someone will take less than 45 minutes to complete the test?

What is the probability that someone will take more than 30 minutes to complete the test?

How long would it take someone to finish the test if they are in the top10% of the times?

# Popper 06

1. If a group of students have test scores that are normally distributed with a mean of 82 and a standard deviation of 4, half of the students made below a grade of:

- a.\78
- b. 74
- **c.** 82
- **d**.70
- e. none of these

Popper 06

H-10 A