11/20/2001	MA331 Applied Prob/Stat I	Name:________________
Dr. Lunsford	Test 2	(100 Points Total)

Neatly show all work on this test. Clearly indicate your answers. Good luck!

I. Multiple Choice. Circle the best answer for each problem. (3 points each – 15 total)

1. A fair die is tossed 15 times and the outcome of each toss is recorded. Let X be the number of fives and sixes that appear in the 15 tosses. Then X has which of the following binomial distributions:

(a) $b(15,\frac{1}{6})$ (b) $b(15,\frac{1}{2})$ (c) $b(15,\frac{1}{3})$ (d) $b(6,\frac{1}{6})$

2. If $X \sim N(0,1)$ then $P(-0.69 < X \leq 1.48) =$

(a) .9306 (b) .7549 (c) .2451 (d) .6855 (e) None of these

3. Suppose X is $N(0,1)$. Find the value of c such that $P(|X| < c) = .9$.

(a) 2.576 (b) 1.645 (c) 1.960 (d) 2.326 (e) None of these

4. Suppose $X \sim N(3,4)$. Then $P(1 \leq X \leq 4) =$

(a) .5328 (b) .8413 (c) .6915 (d) .2902 (e) None of these

5. Suppose the random variable X has the cumulative distribution function

$$F(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \leq x \leq 1. \\ 1, & x > 1 \end{cases} \qquad \text{Then } P(\frac{1}{2} \leq X \leq \frac{3}{2}) =$$

(a) 13/12 (b) 1 (c) 1/4 (d) 9/4 (e) 3/4 (f) None of these

II. An urn contains twelve red and eight white balls. You draw six balls from the urn without replacement. Let the random variable X denote the number of red balls drawn. Please answer the following. (10 points total)

(a) How is the random variable X distributed? (2 points)

(b) How many red balls do you expect to draw (i.e. what is the expected value of X)? (3 points)

(c) Find the probability that you will draw at least one red ball. (5 points)

III. In a recent Gallup Poll (Nov. 8-11), 30% of Americans said they believe the economy is getting better. Let X equal the number of Americans who believe the economy is getting better in a random sample of twenty Americans. Please answer the following. (5 points each – 15 total)

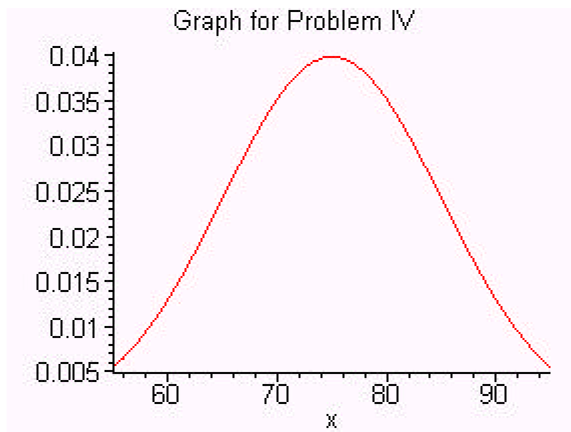
(a) Find $P(X < 10)$

(b) Find $P(X \geq 12)$

(c) Let Y be the number of Americans in the sample who do not believe the economy is getting better. Find $P(Y \geq 12)$

IV. Let $X \sim N(75,100)$. Please answer the following. (5 points each – 10 total)

(a) Find $P(|X - 75| > 9)$. Graphically show the probability you have on the graph of the p.d.f. of X to your right.



(b) Find a number c so that $P(|X - 75| < c) = .95$

V. Suppose X and Y are two independent random variables, X is discrete uniform for $x = 1,\ldots,10$, and $Y \sim b(10, 1/5)$. Please find the following: (16 points total)

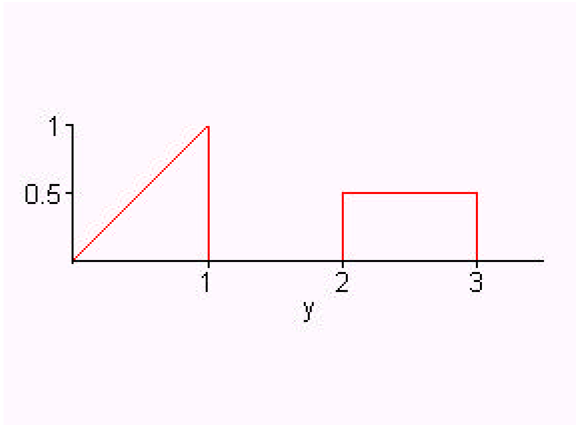
(a) $E(2X + 3Y)$ (4 points)

(b) $P(X = 2, Y = 1)$ (6 points)

(c) $P(X + Y = 2)$ (6 points)

VI. Let Y be a random variable with p.d.f. $f(y)=\begin{cases} y, & 0\le y\le 1 \\ \frac{1}{2}, & 2\le y\le 3 \\ 0, & elsewhere \end{cases}$. A graph of $f(y)$ is given to your right. Please answer the following. (18 points total)

(a) Find the c.d.f. for Y. (5 points)



(b) Show the probability $P(1/2\le Y\le 5/2)$ graphically on the graph of the p.d.f. above. (2 points)

(c) Find the probability in part (b) by using two distinct methods (geometry, using the p.d.f., or using the c.d.f.). Clearly indicate which methods you use. (6 points)

(d) Find $E[Y]$. (5 points)

VII. Suppose $X_i, i = 1,...,9$ is a random sample of soapboxes from a shipment of soapboxes that are normally distributed with mean 6.05 and variance 0.0004. Let $\overline{X}$ be the sample mean of this random sample. Please answer the following (16 points total)

(a) What is $E\left[\overline{X}\right]$?
(3 points)

(b) What is $\text{var}\left[\overline{X}\right]$?
(3 points)

(c) Find $P(\overline{X} < 6.035)$.
(5 points)

(d) Find the probability that at most two of the nine boxes weigh less than 6.0171. (Hint: Let Y be the number of boxes that weight less than 6.0171 and note that $P(X_i < 6.0171) = 0.05$ for each $i = 1,...,9$) (5 points)