Mathematics 210, Lecture 3 (Wilson) Exam II 10/18/96

Your Name: _____

- 1. On the back of this sheet is a table for the standardized normal random variable.
- 2. There are SIX problems. Write your answers to them in the spaces provided. If you must continue an answer somewhere other than immediately after the problem statement, be sure (a) to tell where to look for the answer, and (b) to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.
- 3. If you need scratch paper, please ask for it.
- 4. You have 50 minutes to work on this exam.
- 5. You may refer to notes you have brought in on one sheet of paper, as announced in class.

BE SURE TO SHOW YOUR WORK: YOU MAY RECEIVE REDUCED OR ZERO CREDIT FOR UNSUBSTANTIATED ANSWERS.

Problem	Points	Score
1	14	
2	12	
3	14	
4	12	
5	16	
6	12	
TOTAL	80	

Ζ	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Areas under the Standard Normal Curve, from ${\cal Z}=0$ to the given value of ${\cal Z}$

Problem 1 (14 points)

An urn contains 3 red, 3 blue, and 2 white balls. Two balls are drawn at random and their colors noted.

(a) What is the probability that both are blue?

(b) What is the probability that both are blue, given that neither is red?

(c) What is the probability that both are blue, given that at least one is blue?

Problem 2 (12 points)

A bowl contains pieces of candy. Each has a colored layer on the outside. 4 are red on the outside and chocolate on the inside. 3 are green on the outside and chocolate on the inside. 3 are red on the outside and peanut-butter on the inside. Two pieces of candy are selected randomly, one after the other without replacement, and the color and filling are noted.

(a) Draw a tree diagram to describe this experiment. Show all conditional probabilities along the tree, at each branch, and the probability of each outcome. Be sure to label the tree in such a way that we can tell how it corresponds to the experiment!

(b) What is the probability that both pieces of candy selected are red?

Problem 3 (14 points)

In making up an exam I choose questions from two files of old exams. I pick 40% of my questions from file A and 60% from file B. In file A, 20% of the questions are easy, 50% are medium, and 30% are hard. In file B, 40% of the questions are easy, 40% are medium, and 20% are hard.

(a) What is the probability that any given question on the exam will be easy?

(b) If I pick a question and it is easy, what is the probability that it came from file B?

Problem 4 (12 points)

In a (very unlikely!) lottery each ticket has probability 0.1 of winning something. What is the least number of tickets you can buy which will make the probability that at least one of your tickets is a winner 0.75 or more?

(If the calculations necessary to produce a numeric answer seem prohibitive, give a precise description of what calculations need to be done and how to use their results.)

Problem 5 (16 points)

An unfair coin has probability $\frac{3}{5}$ of giving heads. It is flipped repeatedly until either (i) tails appears or (ii) heads appears three times in a row. The total number of times the coin is flipped is a random variable X.

- (a) What are the values X can take on?
- (b) Give the probability density function for X.

(c) What is the expected value of X?

(d) What is the variance of X?

(e) What is the standard deviation of X?

Problem 6 (12 points)

A random variable X is normal with expected value $\mu = 10$ and standard deviation $\sigma = 3$.

(a) What is $\Pr[10 \le X \le 16]$?

(b) What is $\Pr[13 \le X \le 16]$?