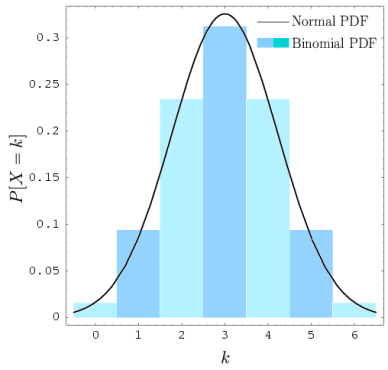

This test has 4 pages.
Please make sure you have them all
right now and just before you turn it in.

There are 25 points total
distributed over 6 problems.

This test is closed book and closed notes.

You will need a calculator and a copy of statistical tables.

When working with numbers,
you may round to 4 digits after the decimal point,
e.g. $3.1415926 \approx 3.1416$.

MA 113 B2 TEST 2

July 27, 2009. Student Name (Last, First) _____

BU ID # _____

Show all your work for full credit.

1. (2 points) Give a statement of the Central Limit Theorem.

2. (6 points) Suppose that the weight of a loaf of scali made in Lyndell's bakery is approximately normally distributed with a mean of 680 g and a standard deviation of 10 g.

(3 points) If a random sample of size 30 is taken, what is the probability that the sample mean is within 1 g of the population mean? (Sample size is ≥ 30, so Z is OK.)

(3 points) If a random sample of size 300 is taken, what is the probability that the sample mean is over 681 g?

3. (5 points) In order to study how copying manuscripts by hand can introduce typos, we take a random sample of 70 hand-made copies of an ancient manuscript. We find that an average scribe introduced 112 typos per 10^6 characters of text, with standard deviation of 10 typos per 10^6 characters.

(2 points) Construct a 95% confidence interval for the mean number of scribal errors per 10^6 characters of text. (Sample size is ≥ 30, so Z is OK.)

(1 point) Construct a 99% confidence interval for the mean number of scribal errors per 10^6 characters of text.

(2 points) Assume that the number of typos per 10^6 characters is approximately normally distributed with a mean of 112 and a standard deviation of 14. What is the minimal sample size to ensure with 99% confidence that the estimate is within 1 unit of the true mean?

4. (2 points) Define Type 1 and Type 2 errors in hypothesis testing.

5. (5 points) A private health insurer is operating under the assumption that the average health insurance claim is for $800. Based on a random sample of 20 claims with a mean of $3230 and a standard deviation of $13300, is there enough evidence to conclude that the population mean is significantly different from $800? Use t (based on a small sample size) and $\alpha = 0.05$.

6. (5 points) The following table summarizes results of a pilot study for a new drug; the "Before" row contains blood pressure measurements taken just before the drug was administered (in mmHg), and the "After" is the same measurement made 10 minutes later.

Test Subject	1	2	3	4	5	6	7	8	9
Before	100	95	102	90	98	111	107	95	113
After	115	100	111	104	105	112	121	114	116
Difference	15	5	9	14	7	1	14	19	3

From this data, the average difference in blood pressure is 9.67 mmHg with standard deviation of 6.14 mmHg. Is there enough evidence to suggest that taking this drug results in increased blood pressure? Run an appropriate test with t statistic and $\alpha = 0.05$.