# MTH 370-01

Exam 3– Winter 2010 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**You must show your work to receive full credit.**

1. [24 pts] A random variable  has the probability density function:



Find:

a. [8 pts]  and .

b. [6 pts] the (piecewise-defined) cumulative distribution function  of .

c. [10 pts] the mean and variance of .

2. [10 pts] Suppose a random variable  has the cumulative distribution function:



Find:

a. [6 pts] the (piecewise-defined) formula for the p.d.f.  of ,

b. [4 pts] .

3. [20 pts] Suppose that 5% of the computer chips made by a particular company have a defect.

a. [12 pts] Let  be the number of defective chips in a random sample of 200. What kind of probability distribution does  have? What are the mean and standard deviation of ?

b. [8 pts] Use a normal approximation to estimate the following (to four decimal places):

i. 

ii. 

4. [6 pts] If IQ scores have a normal distribution with mean 100 and standard deviation 15, what score corresponds to the 80th percentile? (Round to the nearest whole number.)

5. [6 pts] What does Chebyshev’s inequality tell us about the probability a number is within 2.5 standard deviations of the mean?

6. [12 pts] Delivery trucks of a particular company break down, on average, three times per month, according to a Poisson process. Find the probabilities that there are:

a. no breakdowns next month,

b. between 3 and 5 breakdowns, inclusive, next month

b. no more than 4 breakdowns in the next *two* months.

7. [10 pts] Suppose that  is a binomial random variable with  and.  
Find, rounded to four decimals:

a. the exact value of ,

b. the approximation to  we get using a Poisson approximation.

8. [12 pts] If the length  of a phone call made in an airport kiosk is exponential with a mean of 10 minutes, find:

a. the p.d.f. of ,

b. ,

c. .