Signature PRINTED NAME

Math 210 **Exam 1** Jerry L. Kazdan
October 12, 2006 12:00 — 1:20

DIRECTIONS: Part A (short answer) has 7 problems (9 points each) while Part B has 3 problems (15 points each). To receive full credit your solution should be clear and correct. You have 1 hour 20 minutes. Closed book, no calculators, but you may use one 3 $\times$5 with notes on both sides. Please box your answers.

Score	
A-1	
A-2	
A-3	
A-4	
A-5	
A-6	
A-7	
B-1	
B-2	
B-3	
Total	

PART A: SHORT ANSWER, 63 POINTS (9 POINTS EACH)

A-1. Today is Thursday, Oct. 12, 2006. What day of the week is Oct. 13, 2009?

A-2. To whom are you more closely related, your grandmother or your aunt's son? Why?

A-3. There is an outbreak of an unusual disease, expected to kill 600 people. Two public health programs have been proposed to combat it.

- Program A has a 100 percent chance of saving 200 lives.
- Program B had a one-third chance of saving 600 lives and a two-thirds probability of saving no lives.

What is the number of people expected to survive under Program A? Program B?

A-4. In a Table of Life Expentancies, one fnds that in a population of 100,000 females, 90% can expect to live to age 60, while 60% can expect to live to age 80. Given that a woman is 60, what is the probability that she lives to age 80?

A-5. If you roll a die 3 times, what is the probability of getting at least one of them showing a 6?

A-6. Say you have tossed a (fair) coin 99 times and gotten 80 "heads" and 19 "tails". What is the probability that on the next toss it will shown a "head"?

A-7. In the following perl script, what number will appear as the printed **Sum**?

```
#!/usr/bin/perl
$sum=0;
for ($k=1; $k <3; $k++) {
    $sum = $sum + 2*$k;
    }
print "Sum = $sum\n";
```

PART B: 45 POINTS (15 POINTS EACH)

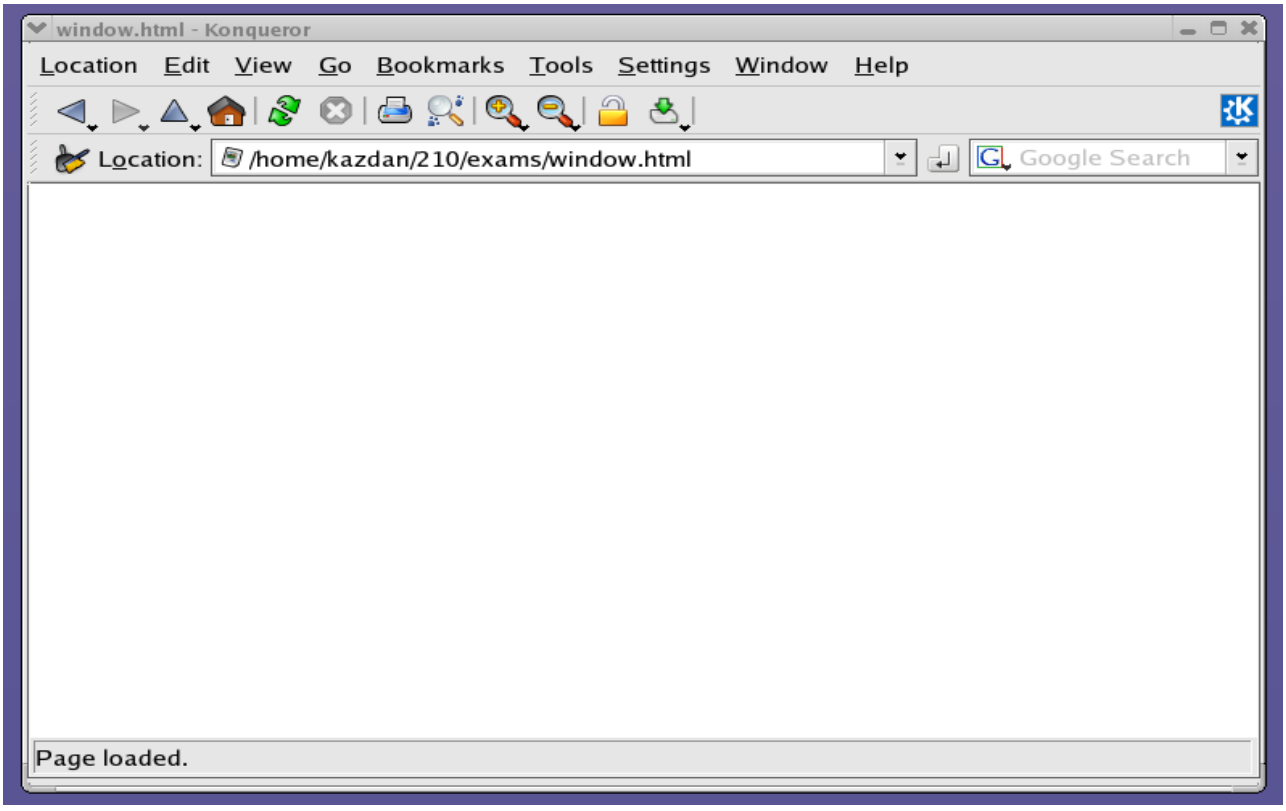
B-1. The following describes a web page. How will it appear? (fill-in the blank page below).

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<HTML><HEAD>
<meta HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=ISO-8859-1">
<TITLE>Math210 Exam1</TITLE>
</HEAD>

<BODY BGCOLOR="yellow">
<center><H1>Math 210 Exam 1</H1></center>

This is our <B>first</B> exam.

      I hope you do well on it.
<P>
Best wishes.
</body></html>
```



B-2. Say you have done an experiment and obtained the data points $(-1, 1)$, $(0, -1)$, $(1, -1)$, and $(2, 3)$. Based on some other evidence you believe this data should fit a curve of the *special* form $y = a + bx^2$.

a) Write the (over-determined) system of equations you would like to solve ideally.

b) Using the method of least squares write the *normal equations* for the coefficients a, b.

c) Explicitly find the coefficients a, b.

B-3. A friend is about to take a test for a relatively rare cancer that has an incidence of 0.1% among the general population. Thus, before taking the test, and in the absence of any other evidence, the best estimate of the likelihood of her having the cancer is 1 in 1000.

Extensive trials have shown that the reliability of the test is 98%, that is, it gives a positive result in 2% of the cases where no cancer is present (*false positive*). Moreover, about 5% of the time the test fails to detect the cancer even though it is present (*false negative*).

QUESTION: If your friend tests negative, what is the probability that she has this cancer? [Do not take time to "simplify" your answer.]