Math 151, Spring 2011
Jo Hardin
HW #2

Homework due on THURSDAY, JANUARY 27TH, START OF CLASS.

1. DeGroot (3^{rd} or 4^{th} ed.), section 1.7: # 5, 8, 9, 10
2. DeGroot (3^{rd} or 4^{th} ed.), section 1.8: # 6, 7, 8, 10, 16
3. Additional problem in R: in 1994 a flaw was discovered in the Intel Pentium chip, which produced an incorrect result when dividing two numbers. Intel initially announced that such an error would occur once in 9 billion divides, or "once in 27,000 years" for a typical user. As a result, they did not immediately offer to replace the chip. What went wrong?

   If an error occurs "once in 9 billion divides", then for one division, the probability that the event E (an error) is

   $$P(E) = 1/9000000000 \text{ and } P(E^c) = 1 - P(E)$$

   The probability of no errors in two divides (assuming that the probability of an error is independent) is equal to $[1 - P(E)]^2$ and the probability of at least one error is $1 - [1 - P(E)]^2$.

   (a) calculate the probability that there is a least one error when two divides are calculated.
   (b) calculate the probability that there is a least one error when 1000 divides are calculated.
   (c) calculate the probability that there is a least one error when 1,000,000 divides are calculated.
   (d) calculate the probability that there is a least one error when 1,000,000,000 are calculated.

   Using R, generate a plot of the probability of at least one error over the range 10,000,000 to 1,000,000,000 along with a paragraph intended for the CEO of Intel discussing these results. Be sure to interpret the figure.

   (Hint: the R code:

```
x = seq(0, 100, length.out=1000)
y = 5*sin(x) + x
plot(x, y, type="l", xlab="X axis", ylab="Y axis")
title("a silly plot")
text(60, 35, "here's some text")
```

   will generate a plot of the function `f(x) = 5sin(x) + x` over the range 0 to 100).