Math 159, Spring 2005
Professor Hardin
HW #2
due Thursday 2/3/05

Section 2.1: 2
Section 2.2: 2, 5, 7, 8
Section 2.3: 1, 2, 6, 7
Section 2.6: 8, 13

Extra Problem: Suppose you know that there are exactly 100 cereal boxes on the shelf. The owner of the grocery tells you that 10 of them have a prize. You think he might be shorting you; you think there are fewer than 10 boxes that have a prize. You are only allowed to open 30 of them, and you must make a decision on whether you believe the grocer.

1. What are your null and alternative hypotheses?
2. What is your test statistic?
3. Create a plot of the power of your test. Using your plot (and possibly specific numerical values from R) find a critical region with a specified level of significance. Argue that your test is reasonable.
4. If you found no boxes with a prize, what is your p-value? (Assume the null hypothesis is that 10 of the 100 have a prize.) Also, report whether these data (0 out of 30) make you believe the grocer or not.

To create a plot of the power function in R (for a binomial test, note that the above is a hypergeometric problem, and you'll have to use *phyper* instead of *pbinom*):

```
> prob<-seq(0,1,by=.01)

> plot(prob,1-pbinom(11,20,prob),type="l",ylab="power = P(rejecting Ho)",
          ylim=c(0,1),xlim=c(0,1))
> lines(prob,1-pbinom(12,20,prob),lty=2)
> lines(prob,1-pbinom(13,20,prob),lty=3)
> lines(prob,1-pbinom(14,20,prob),lty=4)
> lines(prob,1-pbinom(15,20,prob),lty=5)
> lines(prob,1-pbinom(16,20,prob),lty=6)
> lines(prob,1-pbinom(17,20,prob),lty=7)
> lines(prob,1-pbinom(18,20,prob),lty=8)
> lines(prob,1-pbinom(19,20,prob),lty=9)
> lines(prob,1-pbinom(20,20,prob),lty=10)


> legend(0,1,paste("test stat =",11:20),lty=1:10)
```

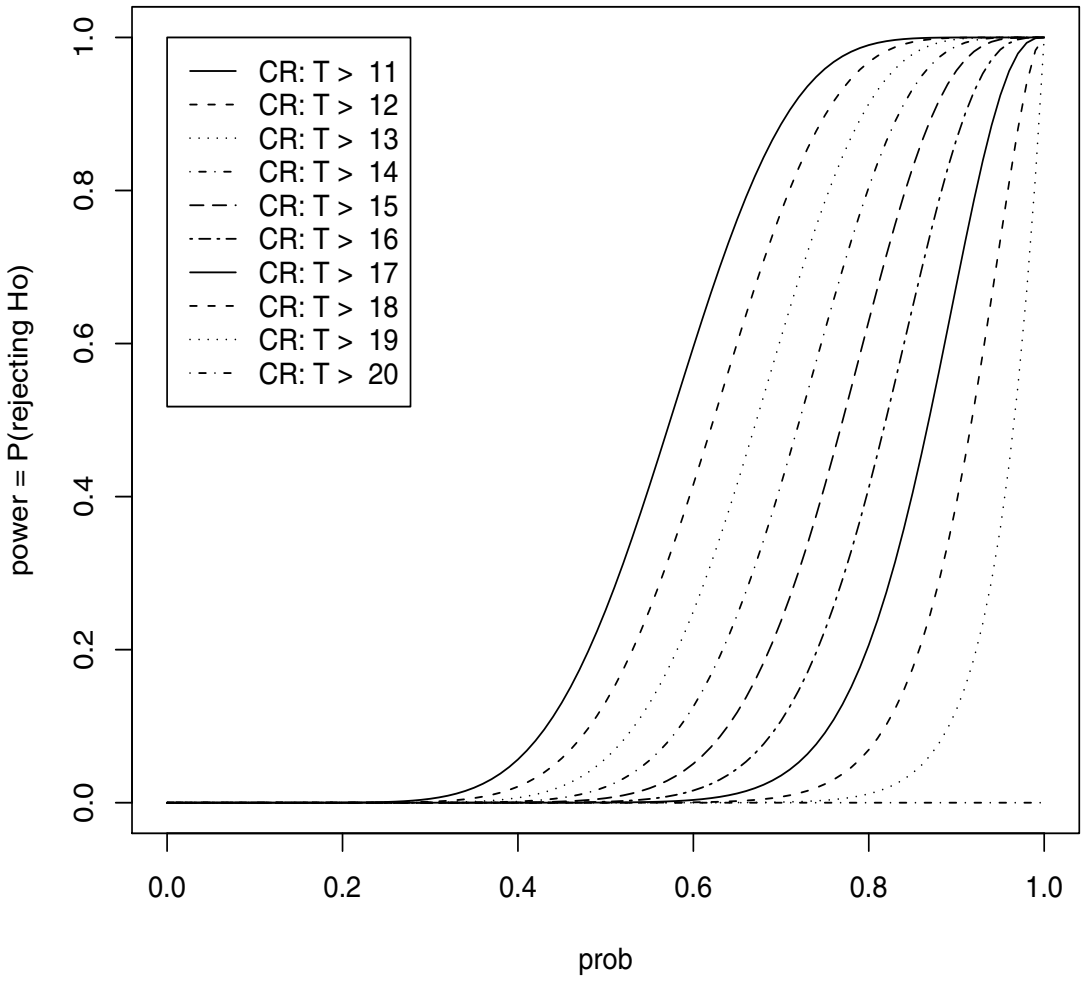

Figure 1: Plot of the power function for various test statistics when testing the probability of success in a binomial with 20 trials.