Stat 532 **Name:** _____
HW 1
Due 9/16/16

Please prepare your solutions using LaTeX or another word processing software.

1. (24 points) Describe the differences between Bayesian and classical inference. Include a discussion on confidence and credible intervals.

2. (1 point) Do you consider yourself a Bayesian or classical statistician?

3. Assume you are hired by Bridger Bowl to compute the probability than an MSU student either skis (or snowboards).
   (a) (10 points) If binary data is collected from 300 students, what is the sampling model for this research question? Please name the distribution and write out the corresponding sampling distribution.

   (b) (10 points) Use a prior distribution from the *Beta* distribution and create a plot/histogram from this distribution. Why did you choose the α and β values for this prior distribution. Hint: R Code

```
x <- seq(0,1,length.out=100)
a <- .1
b <- .1
plot(x,dbeta(x,a,b),type='l',lwd=2,ylab='',xlab='',
sub=paste('alpha', '=' ,a, ',', 'beta', '=',b), main='Beta Distribution')
```

   (c) (15 points) Assume 234 of the sampled MSU students claim to either ski or snowboard. Compute the posterior distribution, $p(\theta|Y)$ where θ is the probability of MSU student skiing and Y is the observed responses.

   (d) (10 points) Plot the posterior distribution computed in part (c).

(e) (10 points) Compute a 95% credible interval for θ.

4. Hoff Exercise 2.1 - Marginal and conditional probability: The social mobility data from Section 2.5 gives a joint probability distribution on (Y_1, Y_2) = (father's occupation, son's occupation). Using this joint distribution, calculate the following distribution:

   (a) (5 points) the marginal probability distribution of a father's occupation

   (b) (5 points) the marginal probability distribution of a son's occupation

   (c) (5 points) the conditional distribution of a father's occupation, given that the father is a farmer

   (d) (5 points) the conditional distribution of a son's occupation, given that the son is a farmer