STAT 301 HW6 due Mon Oct 5

You may work with one partner on this assignment, submitting one report with both names, provided that both students contribute substantially to the work. Word-processed reports are preferred to hand-written ones. Please copy/paste relevant computer output into your report as appropriate.

Sampling Smokers?
According to the Centers for Disease Control and Prevention, about 20% of all adult Americans are smokers. Let's assume that if you select an adult American at random, the probability is .2 that he/she is a smoker. Consider taking a random sample of 200 adult Americans. Denote the sample proportion of smokers by $\hat{p}$.

a) Verify that the Central Limit Theorem (CLT) applies here.

b) What does the CLT say about how the sample proportion of smokers would vary from sample to sample? [Be sure to comment on the shape, center, and spread of this sampling distribution. Also provide a well-labeled graph/sketch.]

c) Use the CLT and the normal distribution to approximate the probability that more than 25% of the sample would be smokers.

d) Use the CLT and the normal distribution to approximate the probability that between 17% and 23% of the sample would be smokers.

e) How would the sampling distribution of $\hat{p}$ (the sample proportion of smokers) change if the sample size were $n = 400$ instead of $n = 200$? What aspects of this sampling distribution remain unchanged?

f) Recalculate your answers to (c) and (d) using a sample size of $n = 400$ rather than $n = 200$.

g) Comment on how your answers to (c) and (d) changed with the larger sample size, and explain why these changes make intuitive sense.