1. An automobile manufacturer who wishes to advertise that one of its models achieves at least 30 mpg (miles per gallon) decides to carry out a fuel efficiency test. Six nonprofessional drivers are selected, and each one drives a car from Phoenix to Los Angeles. The resulting fuel efficiencies (in mpg) are:

30.8  30.0  31.2  28.4  30.3  29.6

Is there enough sample evidence supporting the claim of the manufacturer that the true average fuel efficiency $\mu$ is at least 30 mpg?

a) (0.5 points) Set up the null and alternative hypotheses that we want to test.

b) (1 points) Of which parameters are $\bar{x} = 30.05$ and $s = 0.99$ point estimates? Use these values to compute the test statistic.

c) (1 point) Give the rejection region for $\alpha = 0.01$.

d) (1 point) State the appropriate conclusion in the words of the problem.

e) (1 point) When analyzing the data with R we obtain the following result. Interpret the p-value.

```r
X = c(30.8, 30.0, 31.2, 28.4, 30.3, 29.6)
t.test(X, mu=30, alternative="greater")
```

One Sample t-test

data:  X
t = 0.12403, df = 5, p-value = 0.4531
alternative hypothesis: true mean is greater than 30
95 percent confidence interval:
 29.23771  Inf
sample estimates:
mean of x
 30.05
2. The fasting cholesterol level $X$ of an individual from a certain community has mean $\mu = 200$ and standard deviation $\sigma = 20$. A sample (of size $n = 100$) is selected from this population.

a) (1 point) Determine the approximate sampling distribution of the sample mean $\bar{X} = \sum_{i=1}^{100} X_i/100$, together with its expectation $E(\bar{X})$ and standard deviation $\text{s.d.}(\bar{X})$.

b) (1.5 points) What is the approximate probability that the sample mean cholesterol level $\bar{X}$ is lower than 201?

3. Peripheral neuropathy is a complication of uncontrolled diabetes. The number of cases of peripheral neuropathy among a group of 35 uncontrolled diabetic patients was 12. Let $p$ be the real proportion of uncontrolled diabetics suffering peripheral neuropathy in the population.

a) (0.25 points) Give a point estimate $\hat{p}$ of the parameter $p$.

b) (1.5 points) Construct a 95% confidence interval for $p$.

c) (1.25 points) How many uncontrolled diabetics should be randomly sampled to estimate the true proportion to within .05 with 95% confidence?