Paying for music downloads. If you use the Internet, have you ever paid to access or download music? This was one of the questions of interest in a recent *Pew Internet and American Life Project Survey* (Oct. 2010). In a representative sample of 755 adults who use the Internet, 506 stated that they have paid to download music. Let $p$ represent the true proportion of all Internet-using adults who have paid to download music.

a. Compute a point estimate of $p$. 
$$\hat{p} = \frac{506}{755} = 0.67$$

b. Set up the null and alternative hypotheses for testing whether the true proportion of all Internet-using adults who have paid to download music exceeds 0.7.
$$H_0: p \leq 0.7$$
$$H_1: p > 0.7$$

c. Compute the test statistic for part b.

d. Find the rejection region for the test if $\alpha = 0.01$.

f. Make the appropriate conclusion using the rejection region.

g. Make the appropriate conclusion using the p-value obtained in the following R output:

```
prop.test(506,755, p=0.7, alternative="greater", correct=FALSE)
```

```
1-sample proportions test without continuity correction
data: 506 out of 755, null probability 0.7
X-squared = 3.193, df = 1, p-value = 0.963
alternative hypothesis: true p is greater than 0.7
95 percent confidence interval:
 0.6414909 1.0000000
sample estimates:
   p
0.6701987
```

c. Test statistic: 
$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{0.67 - 0.7}{\sqrt{\frac{0.7 \times 0.3}{755}}} = -1.80$$

d. Rejection region for $\alpha = 0.01$
$$R = \{z > 2.33\}$$

f. $z = -1.80 \notin 2.33 \Rightarrow$ There is no sample evidence (at the 1% significance level) to conclude that $p > 0.7$.

g. We would only reject $H_0$ for $\alpha > 0.963$, which does not include any of the usual significance levels (0.01, 0.05, 0.1). So the sample does not support rejecting $H_0$. 