Math 152 – Fall 2008
Professor Hardin
warm-up # 19

Name: _________________________

Prior to the 1999-2000 NBA season, rules were changed in an effort to increase scoring and make the game more exciting. Previously, the league averaged 183.2 points per game. In a random sample of 20 games, we got $\overline{x} = 195.88$pts and $s = 20.27$pts. Use an improper prior but act like a Bayesian to test whether the new rules have made the average points per game increase.

(Note: we assume here that $\alpha_0 = 0.05 = \frac{\omega_1}{\omega_0+\omega_1}$.)

Solution
From equation 7.6.21, we know the posterior distribution of

$$\frac{n^{1/2}(\mu - \overline{x})}{s} = \frac{20^{1/2}(\mu - 195.88)}{20.27} = 0.2221\mu - 43.217$$

is distributed according to a t with 19 degrees of freedom.

Our test is:

$$H_0 : \mu \leq 183.2\text{pts per game}$$
$$H_1 : \mu > 183.2\text{pts per game}$$

So, we reject H_0 if the posterior probability of H_0 is less than or equal to α_0.

$$\begin{aligned} P(\mu > 183.2|\underline{x}) &= P\Big(\frac{n^{1/2}(\mu - \overline{x})}{s} \leq \frac{n^{1/2}(183.2 - \overline{x})}{s}\Big|\underline{x}\Big) \\ &= P(t_{19} \leq -2.798) \\ &= 0.00574 \end{aligned}$$

Our posterior probability of H_0 is sufficiently low to reject the null hypothesis. We believe that the average number of points per game has indeed gone up since the rule changes. (Note that I didn't say **because** of the rule changes. There could easily have been another causal factor... like a large number of good defenders being injured.)