Math 152, Fall 2008
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HW #6 solutions

From the book: 7.6: 5, 8, 9
In addition:

1. Since $E[\tau] = \alpha_0/\beta_0 = 1/2$ and $var(\tau) = \alpha_0/\beta_0^2 = 1/3$, then $\alpha_0 = 2, \beta_0 = 4$. Also, $\mu_0 = E[\mu] = -5$. Finally, $var(\mu) = \beta_0/[\lambda_0(\alpha_0 - 1)] = 1, \lambda_0 = 4$.

2. It follows from Ex (7.6.9) that the random variable U $= (\mu - 4)/4 \sim t_{2\alpha_0} = t_2$.

   (a) $P(\mu > 0) = P(4U + 4 > 0) = P(U > -1) = P(U < 1) = 0.79$

   (b)

$$\begin{aligned}
P(0.736 < \mu < 15.680) &= P(0.736 < 4U + 4 < 15.680) \\
&= P(-0.816 < U < 2.92) \\
&= P(U < 2.92) - P(U < -0.816) \\
&= P(U < 2.92) - [1 - P(U < 0.816)] \\
&= 0.95 - [1 - 0.75] = 0.7
\end{aligned}$$

3. I didn't realize that they had already basically done this problem for you... See pgs 421-423.

   (a) t-multiplier $= t_{2\alpha_1, 0.05} = t_{22,.05} = -1.717$
   $P(-1.717 < U < 1.717) = 0.90$
   $P(157.82 < \mu < 210.08) = 0.90$
   There is a 0.9 probability that μ is between 157.82 in-patient days and 210.08 in-patient days. That is, the true average number of medical in-patient days is between 157.82 and 210.08 with probability 0.9.

   (b) Now, your degrees of freedom are 17, so $t_{17,.05} = -1.74$
   90% CI for μ: $\overline{x} \pm 1.74 s/\sqrt{n}$
   $182.17 \pm 1.74\sqrt{88678.5/17}/\sqrt{18}$
   $(152.55, 211.79)$
   We are 90% confident that the true average number of medical in-patient days is between 152.55 and 211.79.