A few sample problems for the final (representing material we’ve seen since test 2)

1. Let $X_1, X_2, \ldots, X_n$ be a sample from a Poisson($\mu$) distribution. We’d like to test $H_0: \mu = \mu_0$ against the alternative $\mu \neq \mu_0$. Describe the critical region arrived at by using a likelihood ratio test.

2. Samples of some material are produced by three different experimental processes. They are then tested according to some industrial standard. For process A: 45 of the samples met the standard and 21 did not. For process B: 58 met the standard and 15 did not. For process C: 49 met the standard and 35 did not.

   Test at a .05 level of significance that the three processes have the same probability of meeting the standard.

3. Find the best critical region of size $\alpha = 0.05$ to test the hypothesis $\theta = 1/2$ against the alternative $\theta = 1/4$ for a Bin($n, \theta$) population where $n = 100$.

4. You want to test that the means of two Normal populations (A and B) are the same, i.e. $\mu_A = \mu_B$, against the alternative that $\mu_A > \mu_B$. Let’s say you can only gather 16 observations from population A and 12 from population B, and find that $\bar{x}_A = 415$, $s_A^2 = 700$ and $\bar{x}_B = 350$, $s_B^2 = 692$. Let’s say you are also willing to assume that the true (unknown) variances are equal. What can you conclude at the .01 level of significance.

5. Of 900 Buffalonians asked, 135 preferred Dunkin Donuts to Tim Horton’s. Of 700 Torontonians asked, 77 prefered Dunkin Donuts to Tim Horton’s. Test, at the .05 level of significance, that the proportion of people in Buffalo and Toronto who have terrible taste in donuts (who prefer anything to Tim Horton’s), is the same.