MATH 5090 – Exam 2

Due on Saturday, 11th April 2020 at 9 pm.

Name:

1. 25 calls received by a service desk that is open from 9 am to noon were logged at the following times (hours since 9 am, random variable H) on a single day. Note that 1.85 hours is the same as 1 hour and 51 minutes after 9 am.

0.04	0.41	0.62	0.72	0.90
0.92	1.05	1.08	1.27	1.51
1.52	1.57	1.57	1.59	1.85
2.19	2.25	2.32	2.35	2.49
2.60	2.65	2.66	2.69	2.77

   Test the hypothesis, at a significance level of 0.10, that the logged times are distributed as:

   (a) (10 points) Continuous Uniform.

   (b) (10 points) A Poisson process.

   (c) (10 points) $\mathbb{N}(\mu, \sigma^2)$.

2. (20 points) The contingency table below is from a poll of a simple random sample of female voters from a county:

Age		[18 - 30]	[31 - 50]	≥ 51	Row Totals
Affiliation	Democrat (D)	35	77	56	168
	Republican (R)	23	67	82	172
	Independent (I)	32	96	32	160
	Column Totals	90	240	170	500

   Analyze this data set thoroughly (in full detail) using any subset of the statistical tools from Chapter 13. Write a paragraph summarizing your results. Use $\alpha = 0.05$.

3. Suppose we have 2 observations of X and 3 of Y ($X \perp Y$).
   (a) (10 points) Find the mass functions of Wilcoxon's W_X and Mann-Whitney's U_X.
   (b) (10 points) Show that W_X has the same distribution as W_Y and that U_X has the same distribution as U_Y.
   (c) (10 points) Find a critical region of size 0.2 to test $H_0 : F_X(t) = F_Y(t)$ versus $H_A : F_X(t) > F_Y(t)$ for all t with each of the 4 test statistics. What do you find?

4. (10 points) Find the expectation and variance of W_X (Wilcoxon's Rank Sum Test statistic) in a general context.

5. (10 points) Test the claim that the 25th percentile is 10 verses the alternative that it is less than 10 via sign test. Construct an approximately 70% (conservative) confidence interval for the 25th percentile.

6 7 7 8 10 20 22 25 27 33 40 42 50 55 75 80