MATH 10B
Section 211
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Quiz 12 Solution

Student:
SID:
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True/False - No explanation needed. (For each: 1 point if correct, 0 points if not answered, -1 points if incorrect)

1. For a geometric distribution $X \sim \text{Geom}(p)$, the maximum likelihood parameter $\hat{p}$ is unbiased. True/False

   False. This is equivalent to saying that $E(\frac{1}{1+X}) = p$, which is false.

2. In a hypothesis test we have the formula

   $$\text{power} + \text{significance} = 1$$

   True/False

   False. There is no required relationship between power and significance.

Problems - Needs justification.

1. A university lab detects radio waves from outer space. Radio waves from Voyager 1 occur according to a normal distribution with a mean of 10 gigahertz and a standard deviation of .75 gigahertz. The lab receives a radio message at 12 gigahertz. If the alternative hypothesis is that a different satellite is sending radio waves with a different average frequency, can we refute the assumption that we are receiving information from Voyager 1 with confidence level $\alpha = 0.05$? (10 points)

We received a message that is $\frac{12-10}{.75} \approx 2.67$ standard deviations above the mean. The probability of receiving a message so far away from our mean is at most $2(.5 - z(2.67)) = .0076$. Therefore as our p-value is less than α, we can refute the null hypothesis.