Math 10B with Professor Stankova
Quiz 12; Tuesday, 4/23/2019
Section #206; Time: 9:30 AM
GSI name: Roy Zhao **Name:** _____

Circle True or False or leave blank. (1 point for correct answer, -1 for incorrect answer, 0 if left blank)

1. **TRUE** False The rejection region depends on the significance level α.

Solution: The rejection region is all values of x that make us reject the null hypothesis (when p value is less than α).

2. True **FALSE** If H_0 is that there is no wolf, then the boy who cried wolf made a type 2 error.

Solution: He made a type 1 error.

Show your work and justify your answers. Please circle or box your final answer.

3. (10 points) (a) (4 points) The media says that 90% of the public think that Luka should be the NBA ROY. To test their claim, you ask 9 people who they think should win and only 1 wants Luka to win. If your alternative hypothesis is that less than 90% support Luka, without using CLT, explicitly compute the p value for this hypothesis test. You may leave your answer as a product.

Solution: The null hypothesis is that $p = 0.9$ and the alternative hypothesis is that $p < 0.9$. We want to compute the probability we are even further from the mean which is $P(X \leq 1) = P(X = 1) + P(X = 0)$ for a binomial distribution with $p = 0.9$ and $n = 9$ which gives

$$\binom{9}{1}(0.9)^1(0.1)^8 + \binom{9}{0}(0.9)^0(0.1)^9 = \frac{9 \cdot 9 + 1}{10^9} = \frac{82}{10^9}.$$

(b) (6 points) Now suppose that you ask 100 people and 84 of them want Luka to win. Use a two-sided alternative hypothesis with $\alpha = 0.05$. Can you reject the media's claim? (Hint: $z(2) = 0.4773$)

Solution: We have $p = 0.9$ and $\sigma = \sqrt{p(1-p)} = 0.3$. Then $\sigma_0 = \frac{\sigma}{\sqrt{n}} = \frac{0.3}{\sqrt{100}} = 0.03$. The p value is $P(X \leq 0.84) = \frac{1}{2} - z(\frac{0.9-0.84}{0.03}) = 0.5 - z(2) = 0.0227 < \alpha/2$. We compare to $\alpha/2$ because it is 2 sided. Therefore, we reject the null hypothesis.