0.177
-0.121
-0.102

$\bar{x}_d = -0.084$

$s_d = 0.05227$

$n = 10$

1. (25 points) In the search for a cure for the Coronavirus, it is important to determine what proportion of the population has antibodies, which would likely make them immune to the effects of the disease. A researcher claims that more than 60% of Americans have antibodies for the Coronavirus, whether from vaccination or past infection. Suppose that you take a simple random sample of 850 Americans, test their blood, and find that 540 of them have antibodies. Use a 0.05 significance level to test the researcher's claim.

$n = 850$

$X = 540$

$\hat{p} = \frac{540}{850} = 0.64$

$\hat{q} = 1 - 0.64 = 0.36$

$H_0: p = 0.60$

$H_1: p > 0.60$

$n\hat{p}(1-\hat{p}) \geq 10$

$850(0.64)(1-0.64) \geq 10$

$195.84 \geq 10$ ✓

normal by CLT

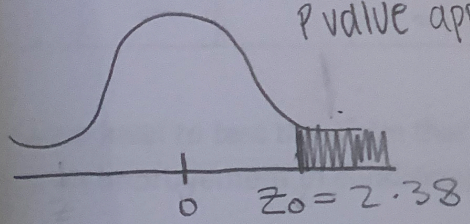
test statistic =

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.64 - 0.60}{\sqrt{\frac{(0.60)(0.4)}{850}}}$$

$$= \frac{0.04}{\sqrt{0.000282353}}$$

$= 2.380475895$

$= 2.38$



P value approach

$P(z_0 > 2.38) = .9913$

table: $1 - .9913 = 0.0087$

tech: p-value = .008656

p value $< \alpha \rightarrow$ reject H_0

$.0087 < 0.05$

Conclusion = At the 0.05 significance level, there is sufficient evidence from the sample data to support the claim that more than 60% of Americans have antibodies for the Coronavirus whether from vaccination or past infection.