Solution to Exam 3

Hongcheng Li

1-12. 5 Points each

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13. 4 points each.

a) \( H_0 : \mu = 25 \quad H_1 : \mu > 25 \)

\[ \bar{x} = 30.7, \sigma = 7, n = 10 \]

b) \( Z_{\alpha} = Z_{0.10} = 1.28 \).

c) \[ Z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{30.7 - 25}{7/\sqrt{10}} = 2.57 \]

d) \( P(x > 2.57) = 0.0051 \)

e) Because \( Z = 2.57 > 1.28 \), we have evidence to reject the null hypothesis at the level of significance \( \alpha = 0.10 \). OR

Because \( P(x > 2.57)) = 0.0051 < \alpha = 0.10 \), the \( p \) value is less than the level of significance, therefore we have evidence to reject the null hypothesis at the level of significance \( \alpha = 0.10 \).

14. 5 points each.

a) \( H_0 : \mu = 18,000 \quad H_1 : \mu > 18,000 \)

b) \[ t = \frac{18500 - 18000}{121/\sqrt{32}} = \frac{500}{121/\sqrt{32}} = 23.4 \]

c) \( t_{0.10} = 1.309 \) with degree of freedom 31.
d) Because the test statistic \( t = 23.4 > 1.309 = t_{0.10} \), We have enough evidence to support the alternative hypothesis at the level of significance \( \alpha = 0.10 \). 

15. 10 points.

a) 
\[
\begin{align*}
H_0 : p &= 0.70 \\
H_1 : p &\neq 0.70 \\
\hat{p} &= \frac{746}{1165} = 0.64 \\
Z &= \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \\
&= \frac{0.64 - 0.7}{\sqrt{0.7 \times 0.3/1165}} \\
&= \frac{-0.06}{0.0134} = -4.4689
\end{align*}
\]

b) \( P(z < -4.4689 \text{ or } z > 4.4689) = 2P(z < -4.4689) = 0 \)

c) The \( p \) values is less than \( \alpha = 0.02 \), we have no evidence to support the null hypothesis.

d) We have enough evidence to support the alternative hypothesis at the level of significance of \( \alpha = 0.02 \).