QUICK HELP
MAT 109 Statistics

Test for Difference of Means

Purpose: To use two different samples from two populations in order to make a conjecture on how the two population means compare.

Hypothesis:
\[ H_0 : \mu_x = \mu_y \]
\[ H_1 : \mu_x \neq \mu_y \text{ (two tailed test)} \]
\[ \mu_x > \mu_y \text{ (one tailed; upper threshold)} \]
\[ \mu_x < \mu_y \text{ (one tailed; lower threshold)} \]

Required Information:
- \( a \) = level of significance
- \( \bar{x} \) = sample mean for x population
- \( n_x \) = size of sample from x population
- \( \sigma_x \) = standard deviation of x population
- \( \bar{y} \) = sample mean for y population
- \( n_y \) = size of sample from y population
- \( \sigma_y \) = standard deviation of y population

Test Statistic:
\[ z = \frac{\bar{x} - \bar{y} - (\mu_x - \mu_y)}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}} \]
\[ \sigma_x^2 = \frac{\sigma^2_x}{n_x} \quad \sigma_y^2 = \frac{\sigma^2_y}{n_y} \]
\[ \sigma_{\bar{x} \bar{y}} = \sqrt{\sigma_x^2 + \sigma_y^2} \]

Test Limit:
For a two tailed test, the test limit will be \( \pm z \) such that the area between \(-z\) and \(+z\) is \( 1-a \).
Reverse look up \( \frac{1-a}{2} \).

For a one tailed test with an upper threshold, the test limit will be \( z \) such that the area to the right of \( z \) is \( a \). Reverse look up \( 0.5 - a \).

For a one tailed test with a lower threshold, the test limit will be \( z \) such that the area to the left of \( z \) is \( a \). Reverse look up \( 0.5 - a \).