Hypothesis Testing (MATH 1442)

Normal population or large sample with known σ (page 419)

Assumptions: random sample, σ is known (rarely happens), n>30 or population is normal

Null Hypothesis: H_0: $\mu = \mu_0$

Test Statistic: $z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$ for any value of n

Alternative Hypothesis:		Rejection Region for α	
H_a:	$\mu > \mu_0$	$z \geq z_\alpha$	(upper-tailed test)
H_a:	$\mu < \mu_0$	$z \leq -z_\alpha$	(lower-tailed test)
H_a:	$\mu \neq \mu_0$	$z \geq z_{\alpha/2}$ $z \leq -z_{\alpha/2}$	(two-tailed test)

Critical values

α	z_α	$z_{\alpha/2}$
.05	1.645	+/- 1.96
.025	1.96	+/- 2.24
.01	2.33	+/- 2.575
.005	2.575	+/- 2.81

Normal population or large sample with unknown σ (page 426)

Assumptions: random sample, σ is unknown (most common situation), n>30 or the population is normal

Null Hypothesis: H_0: $\mu = \mu_0$ $df = n$-1

Test Statistic: $t = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$ for any value of n, For critical values see Table A-3 Page 774

Alternative Hypothesis:		Rejection Region for Level α test	
H_1:	$\mu > \mu_0$	$t \geq t_\alpha$	(upper-tailed test)
H_1:	$\mu < \mu_0$	$t \leq -t_\alpha$	(lower-tailed test)
H_1:	$\mu \neq \mu_0$	$t \geq t_{\alpha/2}$ $t \leq -t_{\alpha/2}$	(two-tailed test)

Population proportion (page 408)

Assumptions: random sample, $np_0 \geq 5$ and $nq_0 \geq 10$, where $p_0+q_0 = 1$

Null Hypothesis: H_0: $p = p_0$

Test Statistic: $z = \frac{\hat{p} - p_0}{\sqrt{p_0 q_0 / n}}$ critical values same as for the normal distribution

Alternative Hypothesis:		Rejection Region for Level α test	
H_1:	$p > p_0$	$z \geq z_\alpha$	(upper-tailed test)
H_1:	$p < p_0$	$z \leq -z_\alpha$	(lower-tailed test)
H_1:	$p \neq p_0$	$z \geq z_{\alpha/2}$ $z \leq -z_{\alpha/2}$	(two-tailed test)

Test for variance or standard deviation (page 436)

Assumptions: random sample, population is normal, observations are independent

Null Hypothesis: H_0: $\sigma^2 = \sigma_0^2$

Test Statistic: $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$ For Critical values see Table A-4 Page 775, $df = n$-1

Alternative Hypothesis:		Rejection Region for Level α test	
H_1:	$\sigma^2 > \sigma_0^2$	$\chi^2 \geq \chi^2_{\alpha,n-1}$	(upper-tailed test)
H_1:	$\sigma^2 < \sigma_0^2$	$\chi^2 \leq \chi^2_{1-\alpha,n-1}$	(lower-tailed test)
H_1:	$\sigma^2 \neq \sigma_0^2$	$\chi^2 \geq \chi^2_{\alpha/2,n-1}$ $\chi^2 \leq \chi^2_{1-\alpha/2,n-1}$	(two-tailed test)