

# Math 481 exam 1

1.  $X \sim N(10, 25)$

(a)  $P(X > 15) = P(Z > 1) = .5 - .3413$

(b)  $P(0 < X < 15) = P(-2 < Z < 1) = P(-2 < Z < 0) + P(0 < Z < 1)$   
 $= P(0 < Z < 2) + P(0 < Z < 1) = .4772 + .3413$

(c)  $P(X > -5) = P(Z > -3) = P(0 < Z < 3) + .5 = .5 + .4987$

(d)  $X_1, \dots, X_{100} \stackrel{iid}{\sim} N(10, 25)$

$$P(\bar{X} > 11) = P\left(\frac{\bar{X} - \mu_{\bar{X}}}{\sigma/\sqrt{n}} > \frac{11 - \mu_{\bar{X}}}{\sigma/\sqrt{n}}\right) = P\left(Z > \frac{11 - 10}{\sqrt{25}}\right)$$

$$= P(Z > 2) = .5 - .4772$$

2. Endpts:  $\hat{\theta} \pm z_{\alpha/2} \sqrt{\frac{\hat{\theta}(1-\hat{\theta})}{n}} = .55 \pm 1.96 \sqrt{\frac{(.55)(.45)}{100}}$

3.  $n_1 = 16$        $n_2 = 10$   
 $S_1^2 = 24$        $S_2^2 = 18$       98% C.I.

$$\frac{S_1^2}{S_2^2} \frac{1}{f_{\frac{\alpha}{2}, n_1-1, n_2-1}} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{S_1^2}{S_2^2} f_{\alpha/2, n_2-1, n_1-1}$$

$$\frac{24}{18} \frac{1}{4.96} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{24}{18} (3.89)$$

4.  $n_A = 15$        $n_B = 16$   
 $\bar{x}_A = 480$        $\bar{x}_B = 510$   
 $\bar{s}_A = 110$        $\bar{s}_B = 90$

(b) Endpts

$$(\bar{x}_A - \bar{x}_B) \pm z_{\alpha/2} \sqrt{\frac{\sigma_A^2}{n_A} + \frac{\sigma_B^2}{n_B}}$$

$$(480 - 510) \pm 1.960 \sqrt{\frac{100^2}{15} + \frac{100^2}{16}}$$

(a) Endpts

$$(\bar{x}_A - \bar{x}_B) \pm t_{\alpha/2, n_1+n_2-2} S_P \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$(480 - 510) \pm 2.045 \sqrt{\frac{(14)110^2 + (15)90^2}{29}} \sqrt{\frac{1}{15} + \frac{1}{16}}$$