MAT 135, Discussion Questions 5.04

1. What is the formula for the test-statistic for two independent samples?

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

2. What is the formula for the degrees of freedom for the two-sample t-test? If you don't use this formula, what is a reasonable, conservative estimate?

assume smaller sample size

$$df = \frac{\left[\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right]^2}{\frac{(s_1^2/n_1)^2}{n_1 - 1} + \frac{(s_2^2/n_2)^2}{n_2 - 1}}$$

3. What is the formula for the confidence interval for a two-sample test?

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2, n-1} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

4. Why do we generally not use Pooled T-tests? What assumptions have to be made when we do used a pooled test?

assumes standard deviations are the same.
Should not use unless good reason to think so

5. Two Dutch researchers conducted a study in which two groups of students were asked to answer 42 questions from Trivial Pursuit. The students in group I were asked to spend 5 minutes thinking about what it would mean to be a professor, while the students in group II were asked to think about soccer hooligans. Then 200 students in group I had a mean score of 23.4 with a standard deviation of 4.1, while the 200 students in group II has a mean score of 17.9 with a standard deviation of 3.9. Is this strong evidence that the priming had a positive effect on scores?

$H_0: \mu_1 = \mu_2$
$H_a: \mu_1 > \mu_2$
2 SampT test
Stats

$\bar{x}_1 = 23.4$
$s_{x1} = 4.1$ $n_1 = 200$
$\bar{x}_2 = 17.9$
$s_{x2} = 3.9$ $n_2 = 200$
μ_1 μ_2 Pooled: No

$t = 13.7457$
$P = 9.66 \times 10^{-36} < .05$ reject null
yes, This is strong evidence for priming

6. Under what conditions can you use each of the following tests?
   a. A dependent two-sample t-test

paired data

   b. An independent two-sample t-test

unpaired data
unknown standard deviations
(or small samples)

   c. An independent two-sample z-test

unpaired data
large sample sizes
known population standard deviations

   d. A two-sample proportion test

2 proportions

$np_1 \geq 10$, $n(1-p_1) \geq 10$
$np_2 \geq 10$, $n(1-p_2) \geq 10$

7. Provide a situation where you'd have to use each of the tests above (they can be textbook problems).

answers will vary