

## REVIEW FOR QUIZ 3, B

### 0.1. List of topics.

- (1)  $t$ -distribution (to test  $H_0 : \mu_X = \mu_Y$ )
- (2)  $F$ -distribution (to test  $H_0 : \sigma_X = \sigma_Y$ )
- (3)  $\chi^2$ -distribution
  - (a) to determine  $\sigma_X$
  - (b) for goodness of fit
- (4) pooled variance
- (5)  $z$ -distribution
- (6) Hypothesis testing
  - (a) Type I and Type II errors
  - (b) significance
  - (c) power of test
- (7) other distributions
  - (a) exponential distribution
  - (b) Poisson distribution
  - (c) normal distribution
  - (d) uniform distribution
- (8) Topic which will not be on the quiz:
  - (a) theory of estimators, MLE, MOM, GMLE (However you need to know the expected values of  $t_\nu$  (zero if  $\nu \geq 2$ ) and  $\chi_\nu^2$  ( $\mathbb{E}(\chi_\nu^2) = \nu$ ).
  - (b) regression
  - (c)  $\Gamma$ -distribution

### 0.2. some questions. Here are some quick questions.

- (1) definitions: What are the definitions of the  $F, t, \chi^2$  distributions?
- (2)  $F$ -distribution: You have two populations of size  $n, m$ . The sample deviations are  $S_X, S_Y$ . You want to test if  $S_Y$  is greater than  $S_X$  with 90% confidence. How do you proceed? Find the pooled variance. Suppose that you decide that  $\sigma_X = \sigma_Y$  then what is the formula for the the 90 confidence interval for the common standard deviation?
- (3)  $t$ -distribution Suppose that you have two populations of size 5, 7. You got  $\bar{X}, \bar{Y}$ . You calculated the pooled variance  $S_p^2 = 25$ . What is the critical value of  $\bar{X}, \bar{Y}$  to test if  $\mu_X = \mu_Y$  against the three possible alternate hypotheses?
- (4)  $\chi^2$ -distribution
  - (a) to determine  $\sigma_X$  If  $S_X^2 = 100$  and  $n = 6$  find the 90% confidence interval for  $\sigma_X$
  - (b) for goodness of fit Test if the the numbers 3,8,10,11 are uniformly distributed.
- (5)  $z$ -distribution (can't think of anything)
- (6) Hypothesis testing
  - (a) Type I and Type II errors: What do these mean?
  - (b) significance  $\alpha$ : Why does  $1 - \beta$  converge to  $\alpha$ ?
  - (c) power of test  $1 - \beta$  What is the definition of power? You are testing the hypothesis that  $\sigma_X = 10$  vs  $\sigma_X > 10$  at 90% confidence. Your sample size is 11. What is the power of the test if  $\sigma_X = 12$ ?