Quiz 8
April 03, 2002

PLEASE NOTE THAT POINTS WILL BE DEDUCTED FOR ILLEGIBLE NAMES

1. (4 pts) Two different methods of manufacture, casting and die forging, were used to make parts for an appliance. In service tests of 100 of each type, 10 castings failed but only 3 forged parts were found to be defective. Find a 96% confidence interval for the difference between the proportions of the cast and forged parts that would fail under similar conditions.
2. Let \( X_1, X_2, \ldots, X_n \) be a random sample from a Uniform \((\theta, \theta + 1)\) distribution. Let \( \bar{X} \) denote the sample mean. Consider the estimator \( \hat{\theta} = \bar{X} \) for \( \theta \). The variance of a Uniform \((a, b)\) distribution is \( \frac{(a-b)^2}{12} \).

(a) (1 pt) Is \( \hat{\theta} \) unbiased for \( \theta \)?

(b) (2 pts) Find the variance of \( \hat{\theta} \).

(c) (3 pts) If you take many different samples of size \( n \) from the above population and use \( \hat{\theta} \) to estimate \( \theta \), what will be the approximate average of the square of the difference between the parameter \( \theta \) and the estimate?