Temple University
Department of Economics

Econometrics I
Functions of Random Variables and Sampling Distributions

1. Let X_1 and X_2 be independent random variables each with probability density function f(x) = 2x for 0<x<1, and zero otherwise. Define $Y = X_1/X_2$. Find P(Y>1/2). (Hint: The probability density for Y defined as the ratio of two r.v.'s is in general given by $g(Y) = \int_{-\infty}^{\infty} |x_2| f(x_2 y, x_2)\, dx_2$)

2. Consider the sample values Y_t (t=1,2,...,T). Show:

$$\max_{1\le t\le T} |y_t - \bar{y}| \ge \left(\frac{T-1}{T}\right)^{\frac{1}{2}} s$$

where $\bar{y}$ and s denote the realized sample mean and sample standard deviation.

3. Let X denote the hours of study required for a passing grade in an econometrics course. Assume that the distribution of X is N(147.8, 12.3^2).

a. Find P(X<163.3).

b. Suppose you sample 25 econ ometrics students at random. What is $P(\bar{X} \le 159.9)$?

c. Find constants a and b such that P($a<S^2<b$) = .90.