

## Homework 6 Supplement, Statistics 200A Fall 2010

1. Let  $X$  have the standard normal distribution. Find the density of  $e^X$ .
2. A laser aimed from a fixed height which is a foot away from an infinite wall makes an angle in the horizontal plane that is uniformly distributed in the interval  $(-\pi/2, \pi/2)$ . Find the density of the point where the laser hits the wall.
3. Assume that  $X$  has a density function  $f(x)$  that is only positive if  $-1 \leq x \leq 1$ . What is the density function of  $|X|$ ? What is the density of  $X^2$ ?
4. Let  $F_1$  and  $F_2$  be two strictly increasing continuous distribution functions such that  $F_1(x) \leq F_2(x)$  for all  $x \in \mathbb{R}$ . Show that there are random variables  $X_1$  and  $X_2$  with these respective distribution functions such that  $X_1 \geq X_2$  (more precisely,  $\mathbb{P}(X_1 \geq X_2) = 1$ ). Hint: Use the construction of a random variable from a uniform random variable.