

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering & Computer Science
6.041/6.431: Probabilistic Systems Analysis
(Fall 2011)

Tutorial 6
October 21, 2011

1. Example 3.19, p. 179, A light bulb produced by the General Illumination Company is known to have an exponentially distributed lifetime Y . However, the company has been experiencing quality control problems. On any given day, the parameter λ of the PDF of Y is actually a random variable, uniformly distributed in the interval $[1, 3/2]$. We test a light bulb and record its lifetime. What can we say about the underlying parameter λ ?
2. Consider a discrete random variable X that takes on only the values $+1$ or -1 with equal probability. Also, let Y be a continuous random variable, independent of X , with $f_Y(y) = \frac{1}{2}e^{-|y|}$, for $-\infty < y < \infty$. Let $Z = X + Y$. Find $p_{X|Z}(x|z)$.
3. Let X be a random variable with PDF f_X . Find the PDF of the random variable $Y = |X|$
 - (a) when $f_X(x) = \begin{cases} 1/3, & \text{if } -2 < x \leq 1, \\ 0, & \text{otherwise;} \end{cases}$
 - (b) when $f_X(x) = \begin{cases} 2e^{-2x}, & \text{if } x > 0, \\ 0, & \text{otherwise;} \end{cases}$
 - (c) for general $f_X(x)$.
4. Let X be a standard normal random variable. Find the PDF of the random variable $Z = 3X^2 - 1$.