

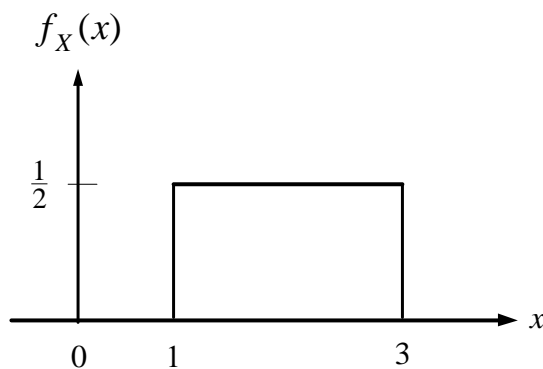
EE 315-Winter 2014(132)  
QZ3

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A random variable  $X$  has a **uniform density** distributed between 1 and 3.

If  $Y = \ln X$ , find the probability density of  $Y$ ,  $f_Y(y)$ ?

**Solution**



$$(a) E[X^2] = \int_{-\infty}^{\infty} x^2 f_X(x) dx = \int_1^3 x^2 \left(\frac{1}{2}\right) dx = \frac{13}{3} = 4.3$$

$$(b) y = \ln x$$

$$\Rightarrow x = e^y \quad \frac{dy}{dx} = \frac{1}{x}$$

$$\Rightarrow f_Y(y) = f_X(x) \left| \frac{dx}{dy} \right|_{x=e^y} = \left(\frac{1}{2}\right) x \Big|_{x=e^y} = \frac{1}{2} e^y \quad 0 < y < \ln 3$$