

## Example with a transformation of one random variable

Suppose  $X$  is an exponential random variable with  $E(X) = 3$   
and suppose  $Y = 5X + 7$

$$\textcircled{1} \text{ Then } E(Y) = E(5X + 7) = 5E(X) + 7 = (5)(3) + 7 = 22$$

$$\textcircled{2} F_Y(a) = P(Y \leq a) = P(5X + 7 \leq a)$$

$$\text{for } a > 7 \quad = P\left(X \leq \frac{a-7}{5}\right)$$

$$= 1 - e^{-((a-7)/5)(1/3)}$$

$$f_Y(y) = \frac{\partial}{\partial y} \left(1 - e^{-((y-7)/5)(1/3)}\right) = \frac{\partial}{\partial y} \left(1 - e^{-((1/15)(y-7))}\right)$$
$$= \frac{1}{15} e^{-((1/15)(y-7))}$$

$$E(Y) = \int_7^{\infty} (y) \left(\frac{1}{15}\right) e^{-((1/15)(y-7))} dy = 22.$$