

(Based on [110.F86.41]) Let $E[X \mid Y = y] = 3y$, $\text{Var}[X \mid Y = y] = 2$ and let Y be an exponential random variable with mean 1. What is $\text{Var}[X]$?

A. 3

B. 5

C. 9

D. 11

E. 20

$$\text{Var } X = E[\text{Var}(X \mid Y = y)] + \text{Var}[E[X \mid Y = y]]$$

$$= E[2] + \text{Var}[3Y]$$

$$= 2 + 3^2 \text{Var}(Y)$$

$$= 2 + 9 \cdot 1^2$$

$$= 11$$