

1. The number of automobiles crossing a certain intersection during any time interval of length  $t$  minutes between 3:00 P.M. and 4:00 P.M. has a Poisson distribution with mean  $t$ . Let  $W$  be the time elapsed after 3:00 P.M. before the first automobile crosses the intersection. What is the probability that  $W$  is less than 2 minutes?

A.  $1 - 2e^{-1} - e^{-2}$       B.  $e^{-2}$       C.  $2e^{-1}$       D.  $1 - e^{-2}$       E.  $2e^{-1} + e^{-2}$

2. Let  $X$  and  $Y$  be continuous random variables with joint density function

$$f(x, y) = \begin{cases} 12x, & \text{for } 0 < y < 2x < 1 \\ 0, & \text{otherwise.} \end{cases}$$

What is the conditional density function of  $Y$  given  $X = x$ ?

- A.  $\frac{1}{2x}$  for  $0 < x < \frac{1}{2}$ ; 0, otherwise  
 B.  $\frac{1}{2x}$  for  $0 < y < 2x < 1$ ; 0, otherwise  
 C.  $\frac{4}{x}$  for  $0 < x < 1$ ; 0, otherwise  
 D.  $\frac{4}{x}$  for  $0 < y < 2x < 1$ ; 0, otherwise  
 E.  $\frac{16x}{1-2y^2}$  for  $0 < y < 2x < 1$ ; 0, otherwise

3. Let  $X$  and  $Y$  be independent random variables, each with density function

$$f(t) = \begin{cases} \frac{1}{2\theta}, & \text{for } -\theta < t < \theta \\ 0, & \text{otherwise.} \end{cases}$$

If  $\text{Var}(XY) = \frac{64}{9}$ , then  $\theta =$

- A. 1      B. 2      C.  $\frac{4\sqrt{3}}{3}$       D.  $2\sqrt{2}$       E.  $\frac{8\sqrt{3}}{3}$

4. Let  $X$  and  $Y$  be continuous random variables with joint density function

$$f(x, y) = \begin{cases} 4x, & \text{for } 0 < x < \sqrt{y} < 1 \\ 0, & \text{otherwise.} \end{cases}$$

What is the marginal density function of  $Y$ , where nonzero?

- A.  $2y^2$       B.  $2y$       C.  $y^2$       D.  $\sqrt{y}$       E.  $4\sqrt{y}$