

# Assignment 30

William Wallius

November 2020

## 30-1

(a)  
(a)

$$\begin{aligned}P(T \leq 1) &= \frac{1}{16} \cdot t^2, t = 1 \\ &= \frac{1}{16} \cdot 1^2 \\ &= \frac{1}{16}\end{aligned}$$

(b)

$$\begin{aligned}P(T \geq 2) &= 1 - \frac{1}{16} \cdot t^2, t = 2 \\ &= 1 - \frac{1}{16} \cdot 2^2 \\ &= 1 - \frac{1}{4} \\ &= \frac{3}{4}\end{aligned}$$

(c)

$$\begin{aligned}P(3) - P(1) &= \frac{1}{16} \cdot 3^2 - \frac{1}{16} \cdot 1^2 \\ &= \frac{9}{16} - \frac{1}{16} \\ &= \frac{8}{16} = \frac{1}{2}\end{aligned}$$

(b)

$$\begin{aligned}P(T \leq 3 | T > 2) &= \frac{P(T \leq 3 \cap T > 2)}{P(T > 2)} \\ &= \frac{P(2 < T \leq 3)}{P(T > 2)} \\ &= \frac{e^{-\frac{2}{5}} - e^{-\frac{3}{5}}}{e^{-\frac{2}{5}}} \\ &= 0.1813\end{aligned}$$

(c)  
(a)

$$\sum_{k=1}^{\infty} \frac{c}{3^k} = 1$$

$$c \sum_{k=1}^{\infty} \left(\frac{1}{3}\right)^k = 1$$

$$\frac{c}{3\left(1 - \frac{1}{3}\right)} = 1$$

$$c = 2$$

(b)

$$P(2, 4, 6) = \frac{2}{3^2} + \frac{2}{3^4} + \frac{2}{3^6}$$

$$= 0.2497$$

(c)

$$\sum_{k=3}^{\infty} \frac{2}{3^k} = \sum_{k=1}^{\infty} \frac{2}{3^k} - \sum_{k=1}^2 \frac{2}{3^k}$$

$$= 1 - \left(\frac{2}{3} + \frac{2}{9}\right)$$

$$= \frac{1}{9}$$