Solution for exercise 4.1.1 in Pitman

Question a) We apply the result for the infinitesimal probability page 263, and recall the standard normal density page 266

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$$

$$P(X \in [0, 0.001]) = f(0) \cdot 0.001 = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}0^2} \cdot 0.001 = 3.99 \cdot 10^{-4}$$

Question b) We follow the same approach as in a)

$$P(X \in [1, 1.001]) = f(1) \cdot 0.001 = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}1^2} \cdot 0.001 = 2.42 \cdot 10^{-4}$$