

Answer on Question #48728 – Math – Statistics and Probability

If the r.v. X is $N(0,2)$. Find $P(1 \leq x \leq 2|x \geq 1)$.

Solution

Using the definition of conditional probability,

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)},$$

It leads to

$$\begin{aligned} P(1 \leq x \leq 2|x \geq 1) &= \frac{P(1 \leq x \leq 2 \text{ and } x \geq 1)}{P(x \geq 1)} = \frac{P(1 \leq x \leq 2)}{P(x \geq 1)} = \frac{P\left(\frac{1-0}{\sqrt{2}} \leq \frac{x-0}{\sqrt{2}} \leq \frac{2-0}{\sqrt{2}}\right)}{P\left(\frac{x-0}{\sqrt{2}} \geq \frac{1-0}{\sqrt{2}}\right)} \\ &= \frac{P(0.71 \leq z \leq 1.41)}{P(z \geq 0.71)} = \frac{P(z \leq 1.41) - P(z \leq 0.71)}{1 - P(z \leq 0.71)}. \end{aligned}$$

From z-table:

$$P(z \leq 0.71) = 0.7611, P(z \leq 1.41) = 0.9207.$$

Thus

$$P(1 \leq x \leq 2|x \geq 1) = \frac{0.9207 - 0.7611}{1 - 0.7611} = 0.6681.$$

Answer: 0.6681.