

D\*. Please solve the following problem; display the computation and upload the resulting pdf document on the appropriate Canvas assignment link:

For an experiment  $x$  is randomly drawn from  $\mathbb{R}$ . Given  $A$  is the event that  $x = 0 \wedge B$  is the event that  $x \in (-0.0001, 0.0001)$ , compute  $p(A | B)$ .

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Sample response:

Since  $|\mathbb{R}| = \mathcal{C}$ , the random variable of this experiment is continuous and, thus,  $p(A) = 0$ . Note that  $p(B) > 0$  since it is probability of  $x$  being contained by an interval that contains 0 rather than  $x$  being the number 0.

So a question to be addressed is whether or not  $p(A | B) > 0$ . I think not since that conditional probability depends on the answer to the following question: Is the probability of  $x = 0$  increased by imposing the condition that  $x$  belongs to a real-numbered interval that contains 0? But just for amusement let's check to see if our definition of conditional probability can inform us:

036B. Definition for *conditional probability* : Given  $A \subseteq \Omega \wedge B \subseteq \Omega \ni p(B) \neq 0$ ,

$$(p(A|B) = \frac{p(A \cap B)}{p(B)})$$

$A \cap B = A$  and we know that  $p(A) = 0$ . Therefore,  $\frac{p(A \cap B)}{p(B)} = 0/y$  for some positive real number  $y$ . So we have demonstrated that  $p(A|B) = 0$ .

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