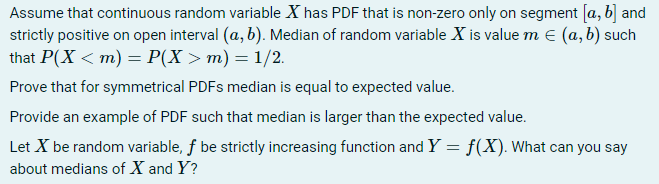
**Task 1**



* As is symmetrical on segment , it’s symmetric about the middle value of this segment .

means that half of the values of X are less than m and the other half is greater than m. This actually means that values of X are distributed symmetrically about m, so is symmetric about m. Hence .

Let’s consider continuous random variable . We can say that is similar to : it’s non-zero on segment and is symmetric about 0.

From the symmetry of about 0 we can conclude that random variable has the same distribution, hence .

On the other hand, because of properties of expected value, .

As such we get that , so .

Now we can use properties of expected value again to find :

, as m is a constant , so

, q.e.d.

* We can take some random variable with non-symmetric distribution and increasing pdf, for example let X have .

Then .

We can also calculate the median.

For such random variable median is greater then .

* If function is strictly increasing, then it basically means that

for any if then .

Then we can say that for any we get , or in other terms .

Taking that into account we can see that is equal to and . So if is the median of , then both of these probabilities are equal 1/2, and as such is the median of .