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Functions of Random Variables: An Example - Quiz

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Question 1

1/1 point (graded)

Let X be a uniform random variable on $[0, 1]$ and let $Y = \frac{1}{x}$.

What is the CDF of y, $F_y(y)$?

a. $1 - \frac{1}{x}$

b. $\frac{1}{y}$

c. 1

d. $1 - \frac{1}{y}$ ✔

e. $\frac{1}{x}$

Explanation

As Professor Ellison demonstrated in lecture, to find the CDF, we start with the definition:

$$F_Y(y) = P(Y \leq y) = P(\tfrac{1}{X} \leq y) = P(X \geq \tfrac{1}{y}) = 1 - \tfrac{1}{y}$$

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✔ Correct (1/1 point)

Question 2

1/1 point (graded)

Continuing with the same example, for what range of y is this expression valid?

a. $0 \leq y \leq 1$

b. $y \leq 1$

c. $y \geq 0$

d. $y \geq 1$ ✔

Explanation

We know that $F_Y(y)$ is non-negative. Hence, from the expression obtained in part (1), we have that:

$$F_Y(y) = 1 - \frac{1}{y} \geq 0$$

Solving for y, we find that the expression is valid for $y \geq 1$. Otherwise, for $y < 1, F_Y(y) = 0$. Note that Professor Ellison referred to this as the "induced support" of Y in lecture.

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Question 3

1/1 point (graded)

True or False: To find the density of Y, you need to integrate the expression for the CDF (obtained above) over the appropriate region.

- True
- False ✔

Explanation

To find the density $f_Y(y)$ from the CDF, you need to differentiate the CDF. Remember, graphically, the CDF is the area under the PDF. So the CDF is obtained by integrating the PDF, and hence to obtain the density from the CDF, you would need to *differentiate* the CDF,

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