

MITx: 14.310x Data Analysis for Social Scientists

Hel

Bookmarks

- Module 1: The Basics of R and Introduction to the Course
- ▶ Entrance Survey
- Module 2: Fundamentals of Probability, Random Variables, Distributions, and Joint Distributions
- Module 3: Gathering and Collecting Data,
 Ethics, and Kernel
 Density Estimates
- ▼ Module 4: Joint,
 Marginal, and
 Conditional
 Distributions &
 Functions of Random
 Variable

Module 4: Joint, Marginal, and Conditional Distributions & Functions of Random Variable > Functions of Random Variables > Linear Transformations of Random Variables - Quiz

Linear Transformations of Random Variables - Quiz

☐ Bookmark this page

Question 1

1/1 point (graded)

Suppose X is a continuous random variable. Let Y = aX + b, where $a \neq 0$ and b are constants. Then which of the following is **not** true about the density of Y?

$$^{\circ}$$
 a. $f_Y(y)=rac{dF_Y(y)}{dy}$

$$ullet$$
 b. $f_Y(y) = P(aX + b \leq y)$

$ullet$
 c. $f_Y(y)=rac{1}{a}f_x(rac{y-b}{a})$ 🗸

d.
$$f(x)=\left\{ egin{array}{l} rac{1}{a}f_x(rac{y-b}{a}), ext{ if } a\geq 0 \ rac{-1}{a}f_x(rac{y-b}{a}), ext{ if } a\leq 0 \end{array}
ight.$$

$$^{\circ}$$
 e. $f_Y(y)=rac{1}{|a|}f_x(rac{y-b}{a})$

Joint, Marginal, and Conditional Distributions

Finger Exercises due Oct 24, 2016 at 05:00 IST

<u>Functions of Random</u> Variables

Finger Exercises due Oct 24, 2016 at 05:00 IST

Module 4: Homework

Homework due Oct 17, 2016 at 05:00 IST

- Module 5: Moments of a Random Variable,
 Applications to Auctions,
 Intro to Regression
- Exit Survey

Explanation

All of the statements above, except c, are mathematically true. However, recall that we needed to consider two cases, the distinction between the sign of a. To see this, recall that if a > 0,

$$F_Y(y) = P(aX \le y - b) = P(X \le \frac{y - b}{a})$$

However, if a < 0,

$$F_Y(y) = P(aX \leq y-b) = P(X > rac{y-b}{a}) = 1 - P(X \leq rac{y-b}{a})$$

Hence, the expression given in c is correct only if a > 0, but not in the case where a < 0.

Submit

You have used 1 of 2 attempts

✓ Correct (1/1 point)

Question 2

1/1 point (graded)

Suppose X is a continous random variable, distributed uniformly over the unit interval [0,1]. Let Y=3X+1 What is the density of $Y,f_Y(y)$ evaluated at y=4.

Please round your answer to the 2 decimal points. For example, if your answer is 0.567, please round to 0.57 and if it is 0.561, please round to 0.56.

0.33

✓ Answer: 0.33

0.33

Explanation

From the formula Professor Ellison derived in lecture, we have that:

$$f_Y(y) = rac{1}{|a|} f_x(rac{y-b}{a})$$

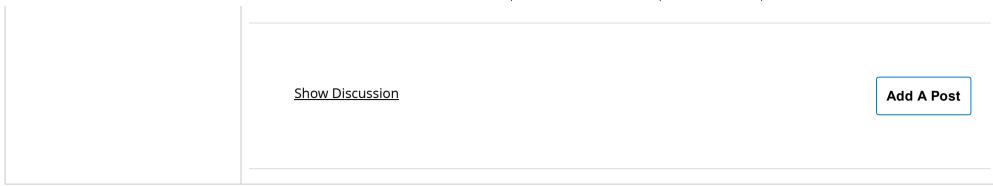
We know that the PDF of a uniform random variable distributed on an interval [c,d] is given by $\frac{1}{d-c}$ for $x \in [c,d]$. Plugging in the numbers, we get:

$$f_Y(y) = rac{1}{|a|} f_x(rac{y-b}{a}) = rac{1}{|3|} f_x(rac{4-1}{3}) = rac{1}{|3|} rac{3}{3}$$

Submit

You have used 1 of 2 attempts

Correct (1/1 point)



© All Rights Reserved



© 2016 edX Inc. All rights reserved except where noted. EdX, Open edX and the edX and Open EdX logos are registered trademarks or trademarks of edX Inc.

















