

#### MITx: 6.041x Introduction to Probability - The Science of Uncertainty

■ Bookmarks

- Unit 0: Overview
- Entrance Survey
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Unit overview

# Lec. 8: Probability density functions

Exercises 8 due Mar 16, 2016 at 23:59 UTC

# Lec. 9: Conditioning on an event; Multiple

Exercises 9 due Mar 16, 2016 at 23:59 UTC

# Lec. 10: Conditioning on a random variable; Independence; Bayes' rule

Exercises 10 due Mar 16, 2016 at 23:59 UTC

### Standard normal table

Solved problems

#### **Problem Set 5**

Problem Set 5 due Mar 16, 2016 at 23:59 UTC

**Unit summary** 

Unit 5: Continuous random variables > Lec. 8: Probability density functions > Lec 8 Probability density functions vertical

■ Bookmark

## Exercise: PDFs

(4/4 points)

Let  $oldsymbol{X}$  be a continuous random variable with a PDF of the form

$$f_X(x) = egin{cases} c(1-x), & ext{if } x \in [0,1], \ 0, & ext{otherwise}. \end{cases}$$

Find the following values.

1. 
$$c = \boxed{2}$$
 Answer: 2

2. 
$$\mathbf{P}(X = 1/2) = \begin{bmatrix} 0 & \checkmark & \text{Answer: } 0 \end{bmatrix}$$

3. 
$$\mathbf{P}\big(X\in\{1/k:k \text{ integer},\,k\geq2\}\big)= \boxed{\hspace{0.2cm} 0}$$
 Answer: 0

4. 
$$\mathbf{P}(X \le 1/2) = \boxed{3/4}$$
 Answer: 0.75

Answer:

. We have 
$$1=\int_{-\infty}^{\infty}f_X(x)\,dx=\int_0^1c(1-x)=c(x-x^2/2)\Big|_0^1=c/2,$$
 and therefore,  $c=2$ .

- 2. Individual points have zero probability.
- 3. Using countable additivity and the fact that single points have zero probability, we have

$$\mathbf{P}ig(X \in \{1/2, 1/3, 1/4, 1/5, \ldots\}ig) = \sum_{n=2}^{\infty} \mathbf{P}(X = 1/n) = \sum_{n=2}^{\infty} 0 = 0.$$

$$^{4.}\mathbf{P}(X \leq 1/2) = \int_{-\infty}^{1/2} f_X(x) \, dx = \int_0^{1/2} 2(1-x) \, dx = 2(x-x^2/2) \Big|_0^{1/2} =$$

You have used 1 of 2 submissions

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