Congratulations! You passed!
TO PASS 75% or higher

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Lesson 3.2-3.3

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1. If continuous random variable X has probability density function (PDF) $f(x)$, what is the interpretation of the following integral: $\int_{-2}^{5} f(x)dx$?

1 / 1 point

- $P(X \leq -2 \cap X \geq 5)$
- $P(X \geq -2 \cup X \leq 5)$
- $P(X \leq -2 \cap X \leq 5)$
- $P(X \geq -2 \cap X \leq 5)$ (selected)

Correct
This could also be written $P(-2 \leq X \leq 5)$.

2. If $X \sim \text{Uniform}(0, 1)$, then what is the value of $P(-3 < X < 0.2)$?

1 / 1 point

0.2

Correct
$\int_{-3}^{0.2} f(x)dx = \int_{-3}^{0.2} I_{\{0<x<1\}}(x)dx = \int_{0}^{0.2} 1dx = 0.2.$

3. If $X \sim \text{Exponential}(5)$, find the expected value $E(X)$. (Round your answer to one decimal place.)

1 / 1 point

0.2

Correct
With $X \sim \text{Exponential}(\lambda)$, we have $E(X) = 1/\lambda$.

4. Which of the following scenarios could we most appropriately model using an exponentially distributed random variable?

1 / 1 point

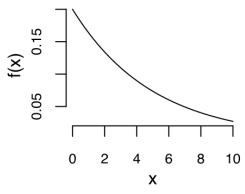
- The probability of a light bulb failure before 100 hours in service
- The number of failed lightbulbs in a batch of 5000 after 100 hours in service
- The lifetime in hours of a particular lightbulb (selected)
- The hours of service until all light bulbs in a batch of 5000 fail

Correct
This is a positive, continuous quantity.

5. If $X \sim \text{Uniform}(2, 6)$, which of the following is the PDF of X?

1 / 1 point

- Option:



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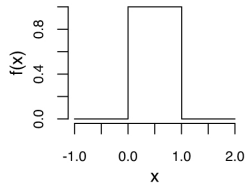

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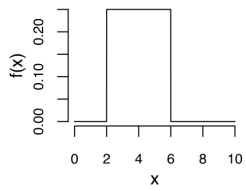

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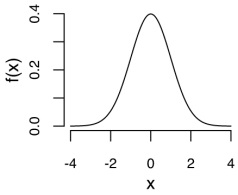

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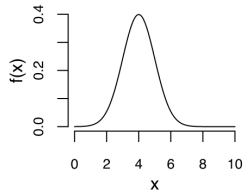


Correct

This PDF has uniform value (1/4) over the interval $[2, 6]$ and is 0 everywhere else.

6. If $X \sim \text{Uniform}(2, 6)$, what is $P(2 < X \leq 3)$? Round your answer to two decimal places. **1 / 1 point**

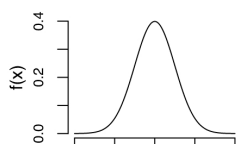
0.25

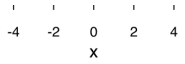
Correct

This is $\int_2^3 1/4 dx$.

7. If $X \sim \text{N}(0, 1)$, which of the following is the PDF of X? **1 / 1 point**

Option:





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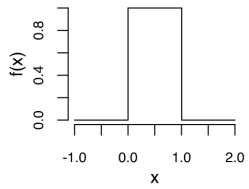

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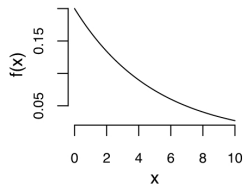

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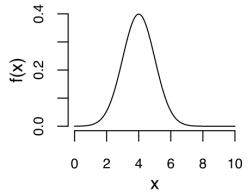

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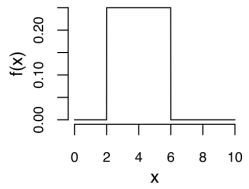

Correct

This is the standard normal distribution.

8. If $X \sim \mathrm{N}(2, 1)$, what is the expected value of $-5X$? This is denoted as $E(-5X)$. **1 / 1 point**

-10

Correct

For any number c and any random variable with expectation $E(X)$, we have $E(cX) = cE(X)$.

9. Let $X \sim \mathrm{N}(1, 1)$ and $Y \sim \mathrm{N}(4, 3^2)$. What is the value of $E(X + Y)$? **1 / 1 point**

5

Correct

For random variables X and Y with expectations $E(X)$ and $E(Y)$, we always have $E(X+Y) = E(X) + E(Y)$.

10. The normal distribution is also linear in the sense that if $X \sim \mathrm{N}(\mu, \sigma^2)$, then for any real constants $a \neq 0$ and b, the distribution of $Y = aX + b$ is distributed $\mathrm{N}(a\mu + b, a^2\sigma^2)$. **1 / 1 point**

Using this fact, what is the distribution of $Z = \frac{X-\mu}{\sigma}$?

- $\mathrm{N}(\mu/\sigma, 1)$
- $\mathrm{N}(\mu, \sigma^2)$
- $\mathrm{N}(\mu, \sigma)$
- $\mathrm{N}(0, 1)$
- $\mathrm{N}(1, \sigma^2)$

✓ **Correct**

Here $a = 1/\sigma$ and $b = -\mu/\sigma$. Subtracting the mean and dividing by the standard deviation is referred to as standardizing a random variable.

11. Which of the following random variables would yield the highest value of $P(-1 < X < 1)$? **0 / 1 point**

Hint: Random variables with larger variance are more dispersed.

- $X \sim \mathrm{N}(0, 0.1)$
- $X \sim \mathrm{N}(0, 1)$
- $X \sim \mathrm{N}(0, 10)$
- $X \sim \mathrm{N}(0, 100)$

! **Incorrect**

Of the four options, this is the most dispersed, and will yield the smallest value of $P(-1 < X < 1)$.

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Lesson 3.2 Uniform distribution

Video • 5 min