

STAT 400: Homework 01

Spring 2018, UIUC

Due: Friday, January 26, 2:00 PM

Please see the [detailed homework policy document](#) for information about homework formatting, submission, and grading.

Exercise 1

(a) Evaluate the following integral. Do **not** use a calculator or computer, except to check your work.

$$\int_0^{\infty} x e^{-2x} dx$$

(b) Evaluate the following integral. Do **not** use a calculator or computer, except to check your work.

$$\int_0^{\infty} x e^{-x^2} dx$$

Exercise 2

Find the value c such that

$$\iint_A c x^2 y^3 dy dx = 1$$

where $A = \{(x, y) : 0 < x < 1, 0 < y < \sqrt{x}\}$. Do **not** use a calculator or computer, except to check your work.

Exercise 3

Suppose $S = \{2, 3, 4, 5, \dots\}$ and

$$P(k) = c \cdot \frac{2^k}{k!}, \quad k = 2, 3, 4, 5, \dots$$

Find the value of c that makes this a valid probability distribution.

Exercise 4

Suppose $S = \{2, 3, 4, 5, \dots\}$ and

$$P(k) = \frac{6}{3^k}, \quad k = 2, 3, 4, 5, \dots$$

Find $P(\text{outcome is greater than } 3)$.

Exercise 5

Suppose $P(A) = 0.4$, $P(B') = 0.3$, and $P(A \cap B') = 0.1$.

- (a) Find $P(A \cup B)$.
- (b) Find $P(B' | A)$.
- (c) Find $P(B | A')$.

Exercise 6

Suppose:

- $P(A) = 0.6$
- $P(B) = 0.5$
- $P(C) = 0.4$
- $P(A \cap B) = 0.3$
- $P(A \cap C) = 0.2$
- $P(B \cap C) = 0.2$
- $P(A \cap B \cap C) = 0.1$

- (a) Find $P((A \cup B) \cap C')$.
- (b) Find $P(A \cup (B \cap C))$.