

Session 09-07: Tasks

Final Recap - Function Analysis & Probability

Exam-Style Problem 1: Function Analysis

Consider the function

$$f(x) = -2x(x - 3)^2 + 4 \quad \text{and} \quad g(x) = -2x + 4$$

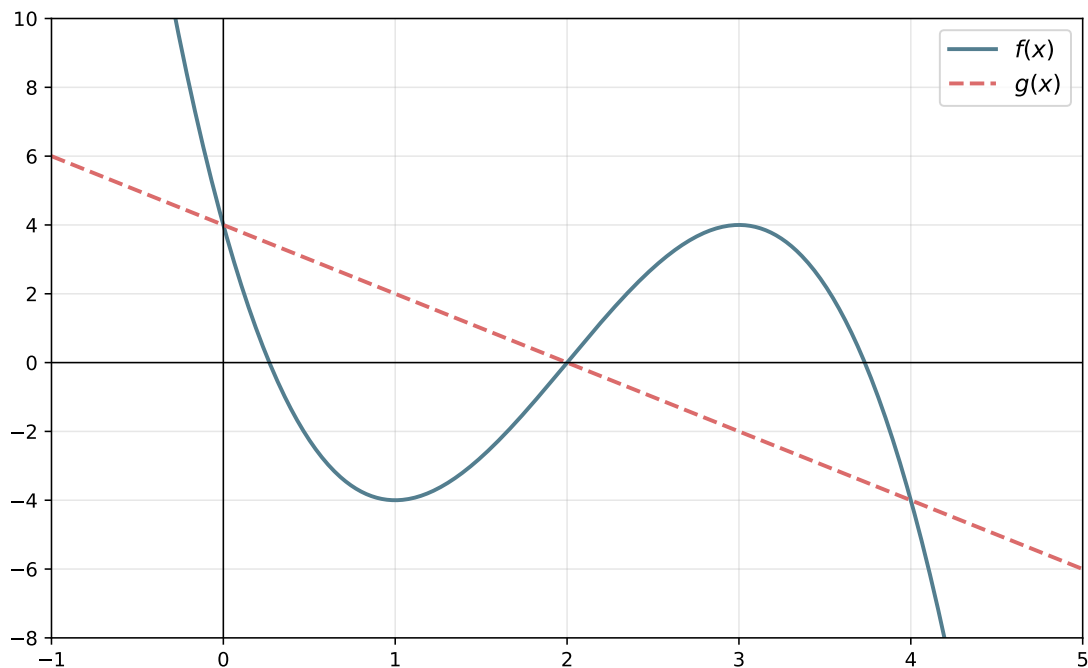


Figure 1: Graphs of $f(x)$ and $g(x)$

Part a)

Verify computationally that $f(x)$ possesses a maximum at $x = 3$.

Part b)

Give a function $f_1(x)$ which is a mirror image of $f(x)$ at the y -axis and give a reason for your choice.

Part c)

The functions $f(x)$ and $g(x)$ enclose two regions. Show computationally that both regions have equal size.

Exam-Style Problem 2: Exponential Function

Consider the function $j(x) = (x - 2) \cdot e^x + 1$.

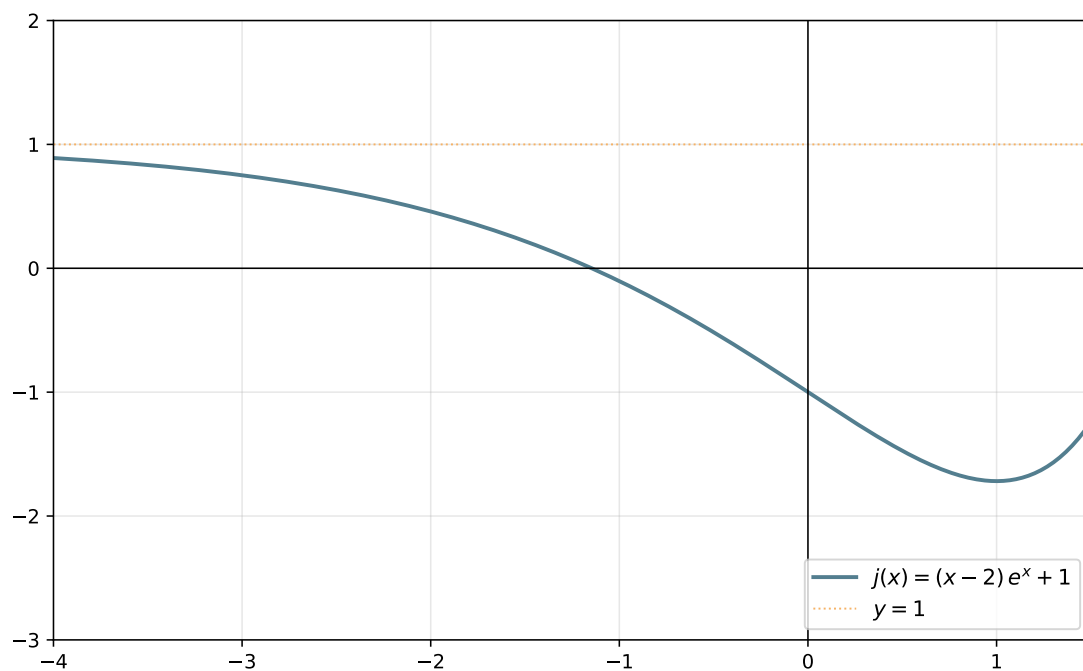


Figure 2: Graph of $j(x) = (x - 2)e^x + 1$

Part a)

Determine the end behavior of $j(x)$ at positive and negative infinity analytically.

Part b)

Compute the inflection point of $j(x)$.

Part c)

Compute the antiderivative of $j(x) = (x - 2) \cdot e^x + 1$.

Exam-Style Problem 3: Probability & Statistics

A bookstore has a reading club for its customers.

Consider the following probabilities:

- The probability of a random person being a customer of this bookstore is 25%.
- A customer of this bookstore has an 80% chance of reading daily.
- A non-customer has a 15% chance of reading daily.

Notation:

- C : “is a customer of this bookstore”
- R : “reads daily”

Part a)

Display the fractions in a contingency table for a population of 100,000 people. Fill in the blank fields.

	C	$\bar{C}$	Sum
R			
$\bar{R}$			
Sum			100,000

Part b)

Compute the probabilities $P(\bar{C} \cap R)$ and $P(R \mid \bar{C})$.

Part c)

A person reads daily. Compute the probability that this person is a customer of the bookstore.

Part d)

For a sample of 10 people determine the likelihood of the following events. This is a binomial distribution with $n = 10$ and $p = P(C) = 0.25$.

$$P(X = k) = \binom{10}{k} (0.25)^k (0.75)^{10-k}$$

1. Exactly 3 persons are customers of this bookstore.
2. Not more than 3 persons are customers of this bookstore.
3. At least 2 but not more than 4 persons are customers of this bookstore.