UNIVERSITY OF TWENTE.

Course	: Calculus 1B	Date	: February 9, 2026
Module	: 1B	Time	: 08:45–10:45
Course code	: 202001[194–201]	Reference	: Test 2

D

Calculus 1B

Exam

Instructions

This exam contains 10 questions. You shall use the attached *answer form* to submit your answers.

- For questions 1–5, you are only required to fill in the **final answer** on the answer form.
- For questions 6–10, you are required to write down a **full calculation and argumentation**.

You will hand in your answer form only. Any text outside the answer form will not be considered.
If you run out of space, you can use the extra space at the end of the answer form. Refer clearly to that space in the original answer.
Do not write with red pen or pencil. Do not use correction fluid or tape.
The use of electronic devices is not allowed!

Final answer questions

Write only your final answer on the answer form.

1. Find the total **area** of the region enclosed by the lines $x = -2$ and $x = 4$ and the graphs of the functions $f(x) = -3x + 10$ and $g(x) = 3x - 2$. [2 pt]

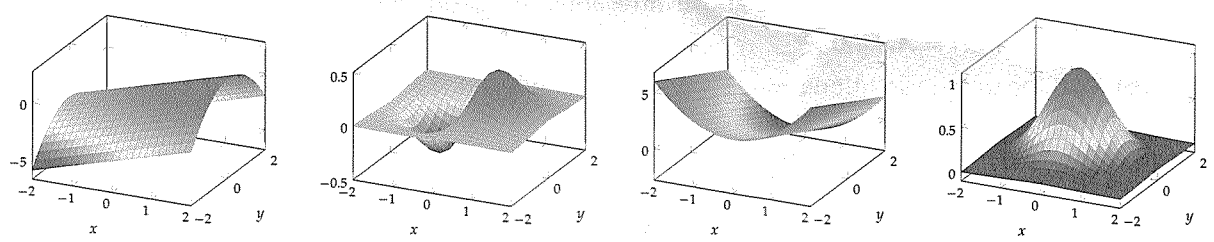
2. Determine $f'(x)$ when f is the function given by [2 pt]

$$f(x) = \int_{2x}^{4} \frac{1}{\sin(\pi t^2) + 3}\, dt\,.$$

3. In Figure 1 below, the following functions have been plotted: [2 pt]

$$f(x,y) = e^{-x^2-y^2}, \qquad g(x,y) = x\,e^{-x^2-y^2}, \qquad h(x,y) = x - y^2, \qquad k(x,y) = x^2 - y.$$

For each function, match it with the figure (A, B, C, or D) that shows its graph.



(A) (B) (C) (D)

Figure 1: The four graphs of Question 3.

4. **(a)** Find the radius and the center of the circle described by the polar equation [2 pt]

$$r = 6\cos\theta - 4\sin\theta\,.$$

(b) The curve described by the polar equation [1 pt]

$$r = \frac{3}{2\cos\theta - \sin\theta}$$

intersects the line $x = 8$ in the point P. Find the y-coordinate of P.

5. **(a)** Find all solutions $z \in \mathbb{C}$ of the equation [2 pt]

$$z^3 = \sqrt{2} + i\sqrt{2}\,.$$

Give your solutions in the form $z = re^{i\theta}$ with $r, \theta \in \mathbb{R}$.

(b) In the Argand diagram on your answer sheet, graph all points $z = x + iy$ that satisfy [2 pt]

$$|z - i| \leq |z|\,.$$

Open questions

Provide a full calculation and argumentation on the answer form.

6. Evaluate the following integral: [4 pt]

$$\int_{-\infty}^{-1} x(3x-2)e^{x^2(x-1)}\,dx\,.$$

7. Evaluate the following integral: [5 pt]

$$\int \arctan(1/x)\,dx\,,$$

where arctan denotes the inverse tangent function.

8. Let the function f be given by

$$f(x,y) = (x+1)\,e^{xy}\,.$$

(a) Find an equation for the plane tangent to the surface $z = f(x,y)$ at the point $P(0,0,1)$. [2 pt]

(b) Find all points Q for which the plane tangent to the surface $z = f(x,y)$ at the point Q is parallel to the x,y-plane. [2 pt]

9. Consider the differential equation

$$xy' + 4y = y^2 + 4, \qquad x > 0\,.$$

(a) Among all the solutions to the above differential equation, there is exactly one **constant** solution $y(x) = A$. Find A. [1 pt]

(b) Find the unique solution $y = y(x)$ to the differential equation that satisfies $y(1) = 1$. [4 pt]

10. Find the unique solution $y = y(x)$ of the differential equation [5 pt]

$$y'' - 2y' + 2y = x^2 + 1\,.$$

that satisfies the initial conditions $y(0) = 0$ and $y'(0) = 0$.

Total: 36 pt