Assignment 10 - Objective

The due date for submitting this assignment has passed. Due on 2020-04-08, 23:59 IST. As per our records you have not submitted this assignment.

1) Consider the change of variables, 
\[ x = u^2 - v^2, \quad y = 2uv. \]
Then the Jacobian \( \frac{\partial(x,y)}{\partial(u,v)} \) is equal to

- 0
- \( u^2 + v^2 \)
- \( u^2 - v^2 \)
- \( 4u^2 + 4v^2 \)

No, the answer is incorrect.
Score: 0

Accepted Answers:
4\(u^2 + 4v^2\)

2) Let \( A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \) be an invertible matrix. Consider the change of coordinates defined by 
\[ A \begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}. \]
Then the Jacobian of the transformation is

- ...

1 point

1 point
\[
\frac{\partial (x,y)}{\partial (u,v)} = A \\
\frac{\partial (x,y)}{\partial (u,v)} = A^{-1} \\
\frac{\partial (x,y)}{\partial (u,v)} = A^T \\
\frac{\partial (x,y)}{\partial (u,v)} = -A
\]

No, the answer is incorrect. Score: 0
Accepted Answers: 
\[
\frac{\partial (x,y)}{\partial (u,v)} = A
\]

3) State whether True or False.
Suppose we consider a coordinate transformation from \((x, y)\) coordinates to \((u, v)\) such that the Jacobian is 0. Then the transformation is NOT invertible.

- True
- False

No, the answer is incorrect. Score: 0
Accepted Answers: 
True

4) Consider the Euclidean norm \(\| \cdot \|_2\) and the supremum norm \(\| \cdot \|_\infty\) on \(\mathbb{R}^n\), defined as
\[
\|x\|_2 = \sqrt{x_1^2 + \cdots + x_n^2} \quad \text{and} \quad \|x\|_\infty = \max\{ |x_1|, \ldots, |x_n| \}, \text{for all} \ x = (x_1, \ldots, x_n) \in \mathbb{R}^n.
\]
Then which of the following inequalities is true, for all \(x \in \mathbb{R}^n\) ?

- \(\|x\|_2 \leq \|x\|_\infty\)
- \(\|x\|_2 \leq 4\|x\|_\infty\)
- \(\|x\|_2 \leq \|x\|_\infty/n\)
- \(\|x\|_2 \leq \sqrt{n}\|x\|_\infty\)

No, the answer is incorrect. Score: 0
Accepted Answers: 
\(\|x\|_2 \leq \sqrt{n}\|x\|_\infty\)

5) Consider the definitions of the Euclidean norm and the supremum norm on \(\mathbb{R}^n\) as given in the previous question. Which of the following inequalities is true, for all \(x \in \mathbb{R}^n\) ?

- \(\|x\|_\infty \leq \|x\|_2\)
- \(n^{1/4} \|x\|_\infty \leq \|x\|_2\)
- \(\|x\|_\infty \leq \|x\|_2/n\)
- None of the above

No, the answer is incorrect. Score: 0
Accepted Answers:
$$\|x\|_\infty \leq \|x\|_2$$