Assessment 1

The due date for submitting this assignment is past.

Due on: Spring 2022, 02-12, 23:48:07.

Unit 2 - Review of linear algebra and multivariable calculus

Course outline

Linear algebra - matrix properties
Matrix properties
Differential and integral calculus
Multivariable and vector calculus

Assessment 1

1. Consider the matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Which of the following statements are true?

2. The determinant of a matrix $A$ is defined as $\det(A) = a_{11}a_{22} - a_{12}a_{21}$. Which of the following statements are true?

3. The eigenvalues of a matrix $A$ are the solutions of the characteristic equation $\det(A - \lambda I) = 0$. Which of the following statements are true?

4. A vector field $\mathbf{F}$ is conservative if there exists a scalar function $f$ such that $\mathbf{F} = \nabla f$. Which of the following statements are true?

5. A function $f(x, y)$ is continuous at a point $(a, b)$ if $\lim_{(x, y) \to (a, b)} f(x, y) = f(a, b)$. Which of the following statements are true?

6. A function $f(x, y)$ is differentiable at a point $(a, b)$ if the partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ exist and are continuous at $(a, b)$. Which of the following statements are true?

7. A surface $S$ is level if $f(x, y) = c$ for some constant $c$. Which of the following statements are true?

8. A manifold $M$ is orientable if there exists a smooth atlas $\mathcal{A}$ on $M$ such that for any two charts $(U, \varphi)$ and $(V, \psi)$ in $\mathcal{A}$, the transition function $\psi \circ \varphi^{-1}$ is a diffeomorphism. Which of the following statements are true?

9. A vector $\mathbf{v}$ is orthogonal to a plane $\Pi$ if the dot product $\mathbf{v} \cdot \mathbf{n} = 0$, where $\mathbf{n}$ is a normal vector to the plane. Which of the following statements are true?