Imperial College London

DEPARTMENT OF MATHEMATICS
IMPERIAL COLLEGE LONDON
Academic Year 2022-2023

Mathematics Pre-arrival course

Test Your Understanding Quiz 3 – Linear Algebra, Sequences and Series

We find that sometimes the typesetting for mathematics on blackboard does not work very well. The first thing to try is to change/update browser, as that sometimes solves the issue completely!

Quiz 1: Linear Algebra and Matrices

For each of the following statements, determine if the statement is True or False:

1. If A and B are two invertible 2×2 matrices, then $(AB)^{-1} = A^{-1}B^{-1}$.
2. If A and B are any 2×2 matrices, then $\det(ABA^{-1}) = \det(B)$.
3. If A and B are any 2×2 matrices, then we have $AB = BA$.
4. The matrix
$$A = \begin{pmatrix} 1 & 2 & 5 \\ 2 & 1 & 3 \\ -4 & 1 & 1 \end{pmatrix}$$
is invertible.
5. The matrix of the linear transformation T which reflects points about the x-axis and then about the y-axis is the same as the matrix of the linear transformation R which rotates points about the origin by π counterclockwise.

Quiz 2: Sequences and Series

For each of the following statements, determine if the statement is True or False:

1. Consider the sequence $\{a_n\}$ defined by the following recurrence $a_n = a_{n-1} - 1$, with $a_1 = 1$, its 40^{th} term is equal to 40.
2. The 10^{th} partial sum of the sequence $\{a_n\}$ whose general term is given by $a_n = 3 + 2(n-1)$ is 120.
3. If $|r| < 1$, then $\sum_{n=1}^{\infty} r^n = \frac{r}{1-r}$
4. $\sum_{n=1}^{\infty} \left(\frac{1}{10}\right)^{n-1} = \frac{9}{10}$.
5. If a sequence $\{a_n\}$ converges, then $\lim_{n\to\infty}(a_n - a_{n+1}) = 0$.
6. $(a_1 - a_2) + (a_2 - a_3) + (a_3 - a_4) + (a_4 - a_5) + (a_5 - a_6) + (a_6 - a_7) + \cdots = a_1$.