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Courses » Theory of groups for physics applications

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# Unit 10 - Week 9

## Course outline

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- Lecture 33: Generators, Discussion Of Lie's Theorems-I

- Lecture 34: Generators, Discussion Of Lie's Theorems-II

- Lecture 35: Group Algebras; SO(3)-SU(2) Correspondence

## Week 9-Assignment 9-MCQ

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-10-03, 23:59 IST.**

1) From infinitesimal rotation about  $x$  axis in 3 dimensions with the  $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$  basis, we can find **1 point**

the angular momentum generator  $L$  about the  $x$  axis as,

$$\begin{pmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ -1 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

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

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{pmatrix}$$

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- always
- None of the above

**No, the answer is incorrect.****Score: 0****Accepted Answers:***iff  $A$  and  $B$  belong to Abelian group*3) The Jacobi identity to be obeyed by elements  $A, B, C$  satisfying a Lie Algebra is **1 point**

$[A, [C, B]] + [B, [C, A]] + [C, [A, B]] = 0$

$[A, [B, C]] + [B, [A, C]] + [C, [A, B]] = 0$

$[A, [B, C]] + [B, [C, A]] + [C, [B, A]] = 0$

$[A, [B, C]] + [B, [C, A]] + [C, [A, B]] = 0$

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

$$[A, [B, C]] + [B, [C, A]] + [C, [A, B]] = 0$$

4) The group manifold of 1 dimensional translations is **1 point**

Real number axis  $[-\infty, \infty]$

Real number axis  $[-\infty, \infty)$

Real number axis  $(-\infty, \infty)$

Real number axis  $(-\infty, \infty]$

**No, the answer is incorrect.****Score: 0****Accepted Answers:***Real number axis  $(-\infty, \infty)$* 5) Lorentz boosts and spatial rotations individually form ----- and ----- respectively. (Fill in **1 point** the blanks)

Compact set, Non-compact group

Compact group, Compact group

Non-compact group, Non-compact set

Non-compact set, Compact group

**No, the answer is incorrect.****Score: 0****Accepted Answers:***Non-compact set, Compact group*6) The number of generators of  $SU(8)$  is **1 point**

8

64 63 65

No, the answer is incorrect.

Score: 0

Accepted Answers:

63

7) Pauli matrices in 2 dimensional representation are

1 point

 all real all traceless all complex all have determinant 1

No, the answer is incorrect.

Score: 0

Accepted Answers:

all traceless

8) A 1-Parameter subgroup of  $GL(n, \mathbb{C})$  is a mapping  $M : \mathbb{R} \rightarrow GL(n, \mathbb{C})$  which follows the property(ies) :

1 point

$M$  is continuous

$M(a + b) = M(a) \cdot M(b)$  as group multiplication

$M(0) = \mathbb{I}_{n \times n}$

All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

All of the above

9) The group manifold of  $SO(3)$  is isomorphic to the topological space

1 point

$S^1$

$S^2$

$\mathbb{R}P^3 \cong S^3 / \mathbb{Z}_2$

$S^3$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\mathbb{R}P^3 \cong S^3 / \mathbb{Z}_2$

10) In Quantum Mechanics the wave function  $\psi$  once specified

1 point

is the unique description of that state of the system

- is one of an equivalence class of complex vectors describing the system
- only its real part is relevant to physics
- only its modulus remains relevant to Physics under all further experiments

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*is one of an equivalence class of complex vectors describing the system*

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