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NPTEL

reviewer3@nptel.iitm.ac.in ▼

Courses » Theory of groups for physics applications

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 9 - Week 8

Course outline

Week 8- Assignment 8-MCQ

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-26, 23:59 IST.

1) In the following groups which is/are connected group(s)? ***1 point***

- $SU(2)$
- $U(n)$
- $GL(n, \mathbb{C})$
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

2) Identify the number of independent parameters in the group $Sp(6)$. ***1 point***

- 12
- 20
- 21
- 6

No, the answer is incorrect.
Score: 0

Accepted Answers:
21

3) An $SU(2)$ matrix $u_{\hat{n}}$ is given as below, where τ^i are Pauli ***1 point***

8-MCQ
Week8- Lecture Slides and Reading Materials
Week8- Assignment8- Solutions
Week 9
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Week 12

$$\begin{pmatrix} \sqrt{3}+i \\ 0 \end{pmatrix}$$

$$\frac{1}{2}\begin{pmatrix} \sqrt{3}+i \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} \sqrt{3}-i \\ 0 \end{pmatrix}$$

$$\frac{1}{2}\begin{pmatrix} \sqrt{3}-i \\ 0 \end{pmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{1}{2}\begin{pmatrix} \sqrt{3}-i \\ 0 \end{pmatrix}$$

4) Obtain a closed form expression for the one parameter subgroup $\exp\{\alpha K_1\}$ where α is a real parameter and $\{K_1\}_{ij} = \delta_{i0}\delta_{j1} + \delta_{j0}\delta_{i1}$, $i, j = 0, 1, 2, 3$ is the generator of Lorentz boosts along the x^1 axis. ***1 point***

$$\begin{pmatrix} \cosh\alpha & -\sinh\alpha & 0 & 0 \\ -\sinh\alpha & \cosh\alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \cosh\alpha & \sinh\alpha \\ 0 & 0 & \sinh\alpha & \cosh\alpha \end{pmatrix}$$

$$\begin{pmatrix} \cosh\alpha & \sinh\alpha & 0 & 0 \\ \sinh\alpha & \cosh\alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} \cosh\alpha & -\sinh\alpha & 0 & 0 \\ \sinh\alpha & \cosh\alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{pmatrix} \cosh\alpha & \sinh\alpha & 0 & 0 \\ \sinh\alpha & \cosh\alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

5) In the following groups which is simply connected group? ***1 point***

$SU(2)$

$U(n)$

$GL(n, \mathbb{C})$

None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
$SU(2)$

6) In Special Relativity, the Minkowski metric is ***1 point***

- valid on all Riemann sheets.
- positive definite.
- not positive definite.
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
not positive definite.

7) For a Unitary matrix U we can write ***1 point***

- $U^{-1} = U^T$
- $U^{-1} = U^\dagger$
- $U^{-1} = U$
- $U = U^\dagger$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$U^{-1} = U^\dagger$

8) In Minkowski space, infinitesimal spacetime interval ***1 point***

- can be positive, negative or zero
- always positive
- always negative
- always takes a constant value

No, the answer is incorrect.
Score: 0

Accepted Answers:
can be positive, negative or zero

9) In spherical polar coordinates in 3 dimensions, $(d\mathfrak{l})^2 = (dr)^2 + r^2(d\theta)^2 + r^2 \sin^2\theta(d\phi)^2$, then the metric of this space can be ***1 point***

written in the $\begin{pmatrix} r \\ \theta \\ \phi \end{pmatrix}$ basis as,

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

$\begin{pmatrix} 1 & 0 & 0 \\ 0 & r^2 \sin^2\theta & 0 \\ 0 & 0 & r^2 \end{pmatrix}$

$\begin{pmatrix} 1 & 0 & 0 \\ 0 & r^2 & 0 \\ 0 & 0 & r^2 \sin^2\theta \end{pmatrix}$

$\begin{pmatrix} r^2 & 0 & 0 \\ 0 & r^2 & 0 \\ 0 & 0 & r^2 \sin^2\theta \end{pmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{pmatrix} 1 & 0 & 0 \\ 0 & r^2 & 0 \\ 0 & 0 & r^2 \sin^2\theta \end{pmatrix}$

10)Find the $\{q^2 p, p^2 q\}_{PB}$, where PB refers to the Poisson Bracket with respect to (q, p). ***1 point***

$-3p^2q^2$

$3pq^2$

$3p^2q$

$3p^2q^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$3p^2q^2$

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