

# Quantum Field Theory I: PHYS 721 (Fall 2021)

## Quick quiz 4

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### Instructions

These quick quizzes are low-stakes assessment tools to help cement your understanding of our material. They will help you remember the key facts and can serve as a study guide to help you focus on material you are less familiar with. These quizzes do not contribute to your grade and are for your own use.

1. **Without looking at your notes or the textbook, and without consulting with your neighbour**, write your answer to each question in the **first column**.
2. Discuss with your neighbour and use your notes or the textbook as needed to answer each question and write your answers to each question in the **second column**. You should complete the second column, but do not add anything to your first column.

There are four questions.

### Question 1

What are the symmetries of the solutions to the free Dirac equation and how do they relate to the Lorentz group?

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### Question 2

What is gauge invariance and how is it related to particles and fields?

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**Question 3**

What do  $A^\mu(x)$  and  $x^\mu$  have in common? What about their differences?

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**Question 4**

How many polarisations does a photon have, and how many polarisations does a  $W^-$  boson have? How do these relate to the representations of the Poincaré group?

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