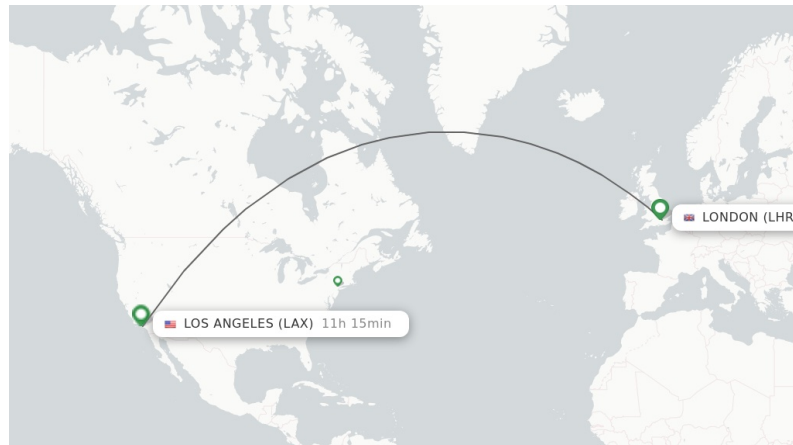


# Introduction to Philosophy of Physics Homework 2

Spacetime, special relativity, general relativity, time travel Due: 24 March 2024

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1. A direct flight from Los Angeles International Airport (LAX) to London Heathrow Airport (LHR) typically covers a distance of 8780km, initially heads  $34^\circ$  northeast after takeoff at LAX, and flies over the southern tip of Greenland. Given the latitude of LAX at  $33^\circ 56' 33''$ N, of LHR at  $51^\circ 28' 39''$ N, and of the southern tip of Greenland at around  $60^\circ$ N, this seems like a big detour (see figure). Explain. [2 points]



2. Draw a spacetime diagram of two-dimensional Minkowski spacetime which includes the following elements: [2 points]
  - (a) The  $t$ - and  $x$ -axes of two distinct frames of reference, including their labels.
  - (b) The worldlines of two inertial observers in relative motion and one non-inertial observer.
  - (c) The set of events which occur 1 second after the event you chose as the origin in *some* frame of reference.
  - (d) The set of events at a spatial distance of 1 meter from the origin in *some* frame of reference.
3. Using a diagram like in the previous problem, explain how inertial observers moving relative to one another disagree about which distant events are simultaneous. Explain your diagram and make sure it contains all elements necessary to explain the relativity of simultaneity. [2 points]
4. In general relativity, the debate among different metaphysical positions concerning time (presentism, growing block, eternalism, etc.) gets complicated by two facts. On the one hand, not all general-relativistic spacetimes permit a foliation into time slices. On the other hand, in some spacetimes, there is a naturally privileged choice of foliation into time slices available. What do you think is the impact of these two facts on the metaphysical debate? Explain your answer. [4 points]