HOMEWORK #1
Due date: Sep 10, 2025 at 15:20

1. Define great and small circles, great and small arcs. Are parallels great or small circles? Are meridians great or small circles? In a spherical triangle, can the sides be small arcs? What is the sum of angles in a spherical triangle?

2. How many decimal places do we need to provide for latitude and longitude to describe one's position to 10 cm? Does the accuracy depend on either latitude or longitude itself, i.e. is $\sigma_\varphi \equiv \sigma_\varphi(\varphi, \lambda)$ and $\sigma_\lambda \equiv \sigma_\lambda(\varphi, \lambda)$?

3. You decide to set the world record in free swimming and you set off from San Diego, CA, to Sydney, AU. What is the shortest length of your swimming path? If you could swim 1 m per second non-stop, how long would you be swimming? Look up geographic coordinates of San Diego and Sydney online.

4. Two ships are steaming along the parallels of latitude 48° N and 15° S respectively, in such a way that at any given moment the two ships are crossing the same meridian. If the speed of the first ship is 15 knots, find the speed of the second ship.

5. RMS Titanic sunk at $\varphi = 41°43'32''$ N, $\lambda = 49°56'49''$ W. It traveled from Southampton ($\varphi = 50°54'18''$ N, $\lambda = 1°24'12''$ W) to New York ($\varphi = 40°16'12''$ N, $\lambda = 73°58'48''$ W). Was this point was on the shortest path between the two cities? If not, how far from it was it?