

## HOMework #1

Due date: Aug 28, 2017 – physical copy in Mary's hands

1. 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  $\sigma_\lambda \equiv \sigma_\lambda(\varphi, \lambda)$ ?
2. 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? Sketch your swimming path and compute all angles and sides. Look up geographic coordinates of San Diego and Sydney online.
3. Two ships are steaming along the parallels of latitude  $48^\circ$  N and  $15^\circ$  S respectively, in such a way that at any given moment the two ships are on the same meridian of longitude. If the speed of the first ship is 15 knots, find the speed of the second ship.
4. RMS Titanic sunk at  $\varphi = 41^\circ 43' 32''$  N,  $\lambda = 49^\circ 56' 49''$  W. It traveled from Southampton ( $\varphi = 50^\circ 54' 18''$  N,  $\lambda = 1^\circ 24' 12''$  W) to New York ( $\varphi = 40^\circ 16' 12''$  N,  $\lambda = 73^\circ 58' 48''$  W). Was this point was on the shortest path between the two cities? If not, how far from it was it?
5. Queen Mary steams from  $\varphi = 39^\circ 20' 00''$  S,  $\lambda = 110^\circ 10' 00''$  E to  $\varphi = 44^\circ 30' 00''$  S,  $\lambda = 46^\circ 20' 00''$  W. What is the shortest possible route between those two points if Queen Mary cannot cross the  $62^\circ$  S parallel?
6. *Extra credit:* In a spherical triangle  $ABC$ ,  $C = 90^\circ$ ,  $a = 119^\circ 46' 36''$  and  $B = 52^\circ 25' 38''$ . Compute the values of  $b$ ,  $c$  and  $A$ .