Problems on Chapter 3: Equations of Motion

Q 3.1: From a collection of observing stations near a large city, it is found that the mixing ratio of ozone at 11am increased towards the East by 141 ppbv for every 100 km. The wind velocity was everywhere a uniform 5ms^{-1} from the NE, and the mixing ratio at that station was 310 ppbv at 11am. Estimate the mixing ratio at 12noon at that station due to advection alone. You may assume that vertical motions are not relevant to that situation.

Q 3.2: What is the difference between true and apparent gravity

(a) at the North Pole, (b) at the equator, (c) at 45°N?

Data:

Radius of Earth 6371 km

Rate of Earth's rotation, $\Omega = 7.292 \times 10^{-5}$ s^{-1}