

THE UNIVERSITY OF BRITISH COLUMBIA

Math 414 Section 101

Homework 1

Due by 1pm on September 13, 2019

1. Suppose a cube is embedded in a sphere such that the vertices are touching the sphere. If the area of one of the faces of the cube is 16, then find the volume of that part of the sphere that lies outside the cube. (Linh's problem).
2. Two stores have warehouses in which wheat is stored. There are 16 more tons of wheat in the first warehouse than in the second. Every night exactly at midnight the owner of each store steals from his rival, taking a quarter of the wheat in his rival's warehouse and taking it to his own. After 10 days the thieves are caught. Which warehouse has more wheat at this point and by how much?
3. A car is travelling at 30m/s along a road, and a limousine is travelling at 24m/s in the opposite direction. If the car is 3 m long and it takes $\frac{1}{6}$ of a second for the car and the limousine to completely pass by each other, then how long is the limousine?
4. A spherical alien spaceship crashed into the ocean and partially buried itself in the flat sand on the ocean floor. Divers found a hump of the sphere sticking $\frac{1}{2}$ m out of the ocean floor with a diameter of 8 m. What is the volume of the entire spaceship?
5. Invent a grade 8-10 workshop problem and write out a detailed solution for someone giving a workshop. Take as inspiration some UBC Grade 8-10 workshop problem from 2009-2010. Identify explicitly the problem you used. Alternatively you may use another source and identify it or simply create a problem using your own imagination.

Note: Please make a photocopy or handwritten copy of the problem you create in question 5 and hand it in at the same time as the homework.