

Mathematics 1120H – Calculus II: Integrals and Series

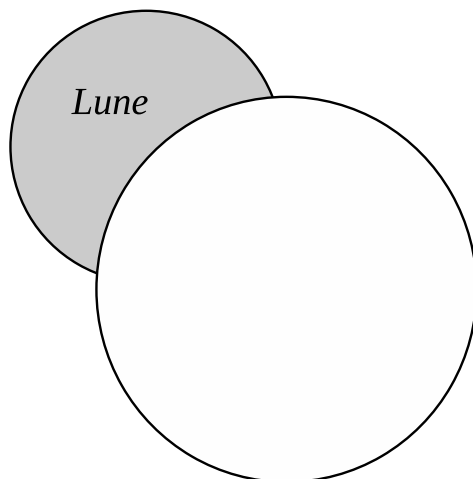
TRENT UNIVERSITY, Winter 2020

Assignment #2

Lunes

Due on Thursday, 30 January.

The region inside one but outside the other of two overlapping circles is called a *lune*.



One of the earliest successes in computing areas of non-polygonal plane regions was by Hippocrates of Chios\* (c. 470–410 B.C.), who found the total area of certain pairs of lunes.

1. Find the area of the region that is inside the circle  $x^2 + y^2 = 9$  and outside the circle  $x^2 + (y - 4)^2 = 25$ . [6]
2. Suppose  $R > r > 0$ . A circle of radius  $r$  has its centre a distance somewhere strictly between  $R - r$  and  $R$  from the centre of a circle of radius  $R$ .
  - a. Sketch this arrangement of circles. [1]
  - b. Find the area of the lune inside the circle of radius  $r$  and outside the circle of radius  $R$ . [3]

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\* Not to be confused with his rather better known contemporary, the physician Hippocrates of Cos (c. 460–370 B.C.), after whom the Hippocratic Oath is named.