

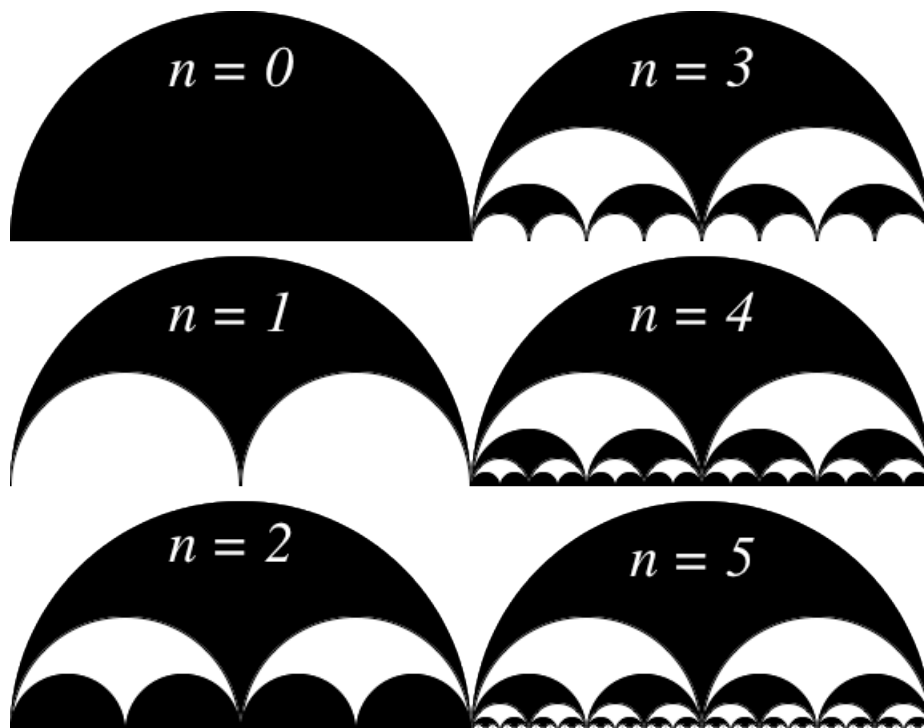
Mathematics 1100Y – Calculus I: Calculus of one variable
TRENT UNIVERSITY, Summer 2011

Assignment #1
Alien Batman logo?!
Due on Monday, 16 May, 2011.

Consider the shape obtained as follows:

0. Start with a half-disk of radius 1.
1. Remove two side-by-side half-disks of radius $\frac{1}{2}$ (straight edges aligned!).
2. Add back in four side-by-side half-disks of radius $\frac{1}{4}$ (straight edges aligned!).
3. Remove eight side-by-side half-disks of radius $\frac{1}{8}$ (straight edges aligned!).
4. Add back in sixteen side-by-side half-disks of radius $\frac{1}{16}$ (straight edges aligned!).
- ⋮
- $2k$. Add back in [how many?] side-by-side half-disks of radius [?] (straight edges aligned!).
- $2k+1$. Remove [how many?] side-by-side half-disks of radius [?] (straight edges aligned!).
- ⋮

The first few steps of this process are illustrated below:



1. How many half-disks are added back in or removed at step n of the process? What is their radius? [5]
2. What is the area of the shape obtained after infinitely many steps of this process? [5]