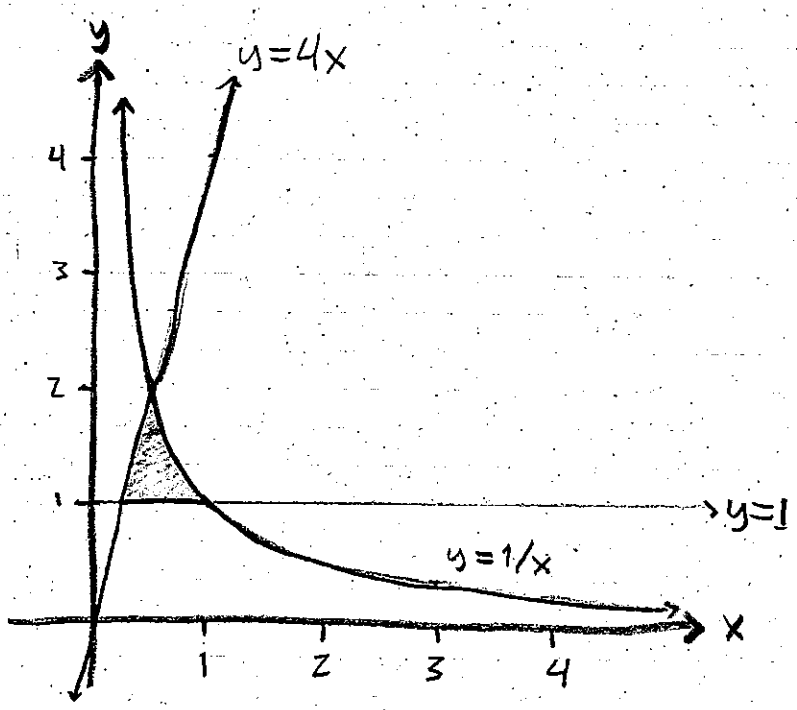
Worksheet for 12/3/13

Part 1

① 

Compute the area of the region bounded by

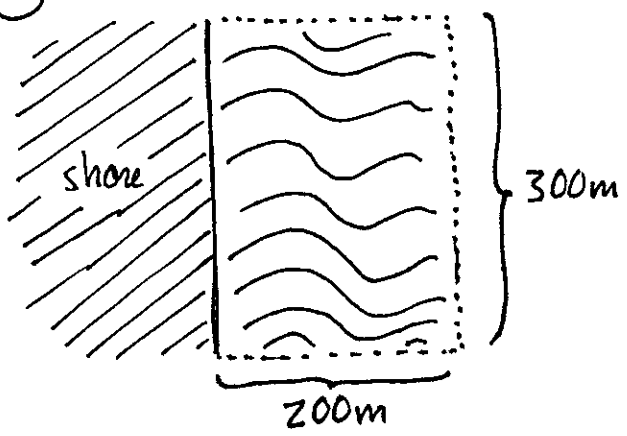
$y=1$,
$y=4x$, and
$y=1/x$,

by vertical or horizontal slicing.

② Compute $\int_0^{1/2} \arcsin x \, dx$ by horizontal slicing. (It is also possible to compute this using integration by parts).

Part 2

(1)



A certain patch of ocean is home to a population of jellyfish. The density of the jellyfish depends on the distance to the shore: it is

$\rho(x)$ jellyfish per m^2

where x = distance to shore (in meters).

We want to calculate the number of jellyfish in the 200m by 300m region shown.

a) How could you slice this region into n rectangles so that the jellyfish density is close to constant in each rectangle?

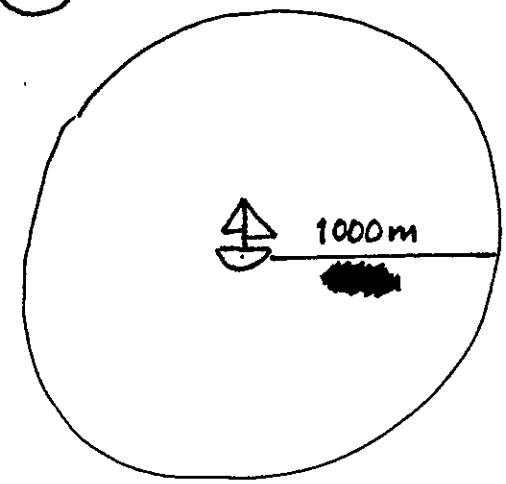
b) What is the approximate <u>number</u> of jellyfish in the k^{th} slice?

c) Write a sum that gives the approximate total number of jellyfish.

d) Write an <u>integral</u> to compute the number of jellyfish.

e) Compute this integral in the case that $\rho(x) = 2^{-x/50}$.

(2)



Some sharks are forming a group around your boat. Suppose there are $\rho(r)$ sharks per square meter at distance r meters from your boat.

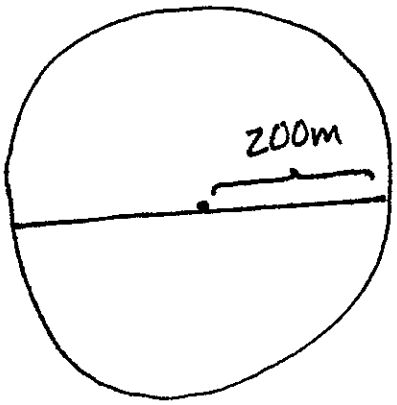
a) Write an integral that gives the total number of sharks within 1000m of your boat.

(follow the same basic steps as parts (a)-(d) of problem 1, but this time do not slice into rectangles. How should you slice?)

b) Compute this integral in case $\rho(r) = e^{-r^2/1000}$.

c) Compute this integral in case $\rho(r) = e^{-r/1000}$.

(3)



A circular lake of radius 200m has a rope across the middle. There are $\rho(y)$ lily-pads per square meter at a distance y meters from this rope.

a) Write an integral that gives the number of lily pads in the lake.