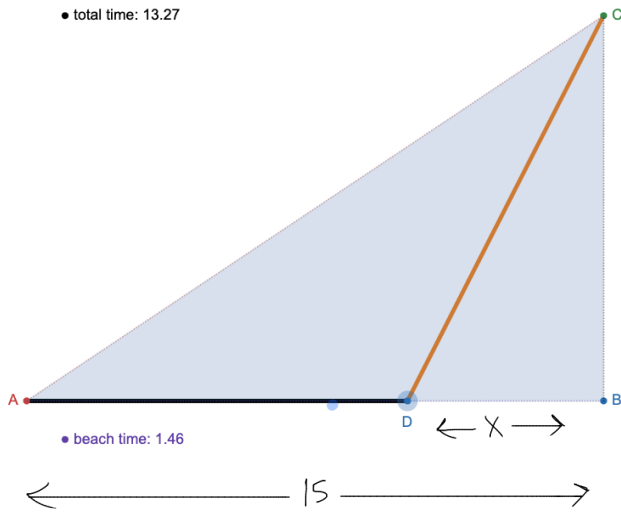


Wk 13 - Thur

4-7-16

assign $x = \text{dist}(D, B)$



Assumptions:

$$D = R \cdot T \rightarrow T = D/R$$

Dog's speed on beach: 6.8 m/s

Dog's speed in water: 0.95 m/s

$\text{dist}(B, C) = 10$

$\text{dist}(A, B) = 15$

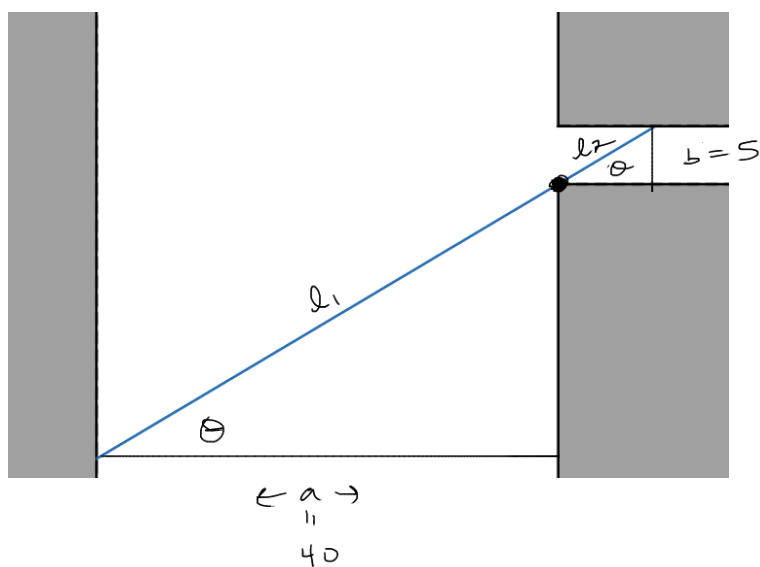
Question: how close to B should dog be to minimize total time?

Plan: Total time = beach time + swim time

$$T(x) = \frac{(15-x)}{6.8} + \frac{\sqrt{x^2 + 100}}{0.95}$$

take $T'(x)$, set = 0, solve ...

longest pole; shortest dist. b/w two walls that goes through corner



key: angle θ
basic trig \Rightarrow relate l_1 to θ
 l_2 to θ

$$l_1 = f(\theta)$$

$$l_2 = g(\theta)$$

total
 $l = l_1 + l_2$

shortest (l)

take $l' = 0$

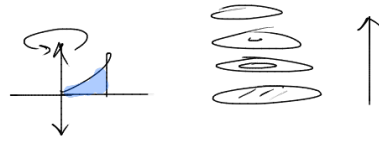
"
 $l_1' + l_2'$

Volumes of Solids of Revolution

① Is the axis of revolution vertical \downarrow or $x=5, x=-1$
 or horizontal \leftrightarrow $y=3, y=-1$

② Vertical:

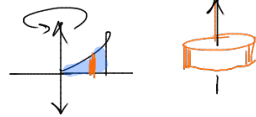
washer/disc method; int. wrt. y



bounds: max/min height

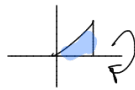
get all variables in terms of y .

shell method:



axis of shell = axis of revolution
 but we integrate perpendicular to that
 (dx)

Horizontal:



washer/disc method

always int along axis (dx)

} all variables: x

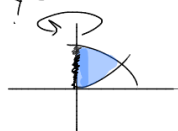
shell method

always int \perp to axis (dy)

} all variables in terms y

③ washer vs. disc?

does your region share an edge w/ the axis?

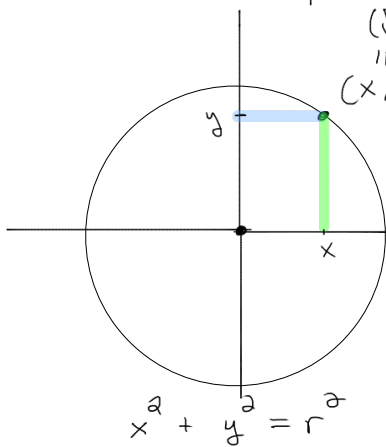


yes \Rightarrow disc

no? \Rightarrow washer

if you know y , solve for x

④



$(\sqrt{r^2 - y^2}, y)$
 " $(x, y) = (x, \sqrt{r^2 - x^2})$ "

if you know x , solve for y

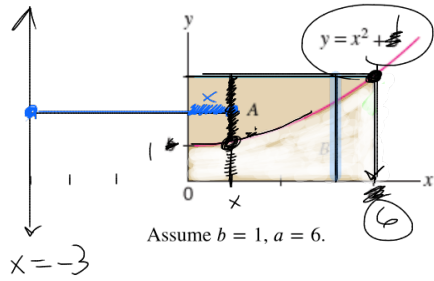
the blue segment's length = $x = \sqrt{r^2 - y^2}$

the green segment length = $y = \sqrt{r^2 - x^2}$

$x^2 + y^2 = r^2$

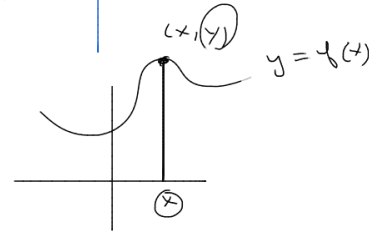
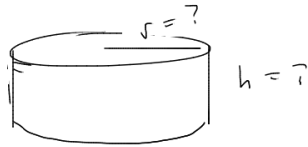
Question 8 of 8

Use the Shell Method to find the volume of the solid obtained by rotating the region A in the figure about $x = -3$.



shell \Rightarrow int. \perp axis
 \Rightarrow int wrt. x

vertical



$$r = x - (-3) = x + 3$$

$$\text{height} = 37 - (x^2 + 1)$$

$$V = \int_0^6 2\pi (x+3)(37 - (x^2+1)) dx$$