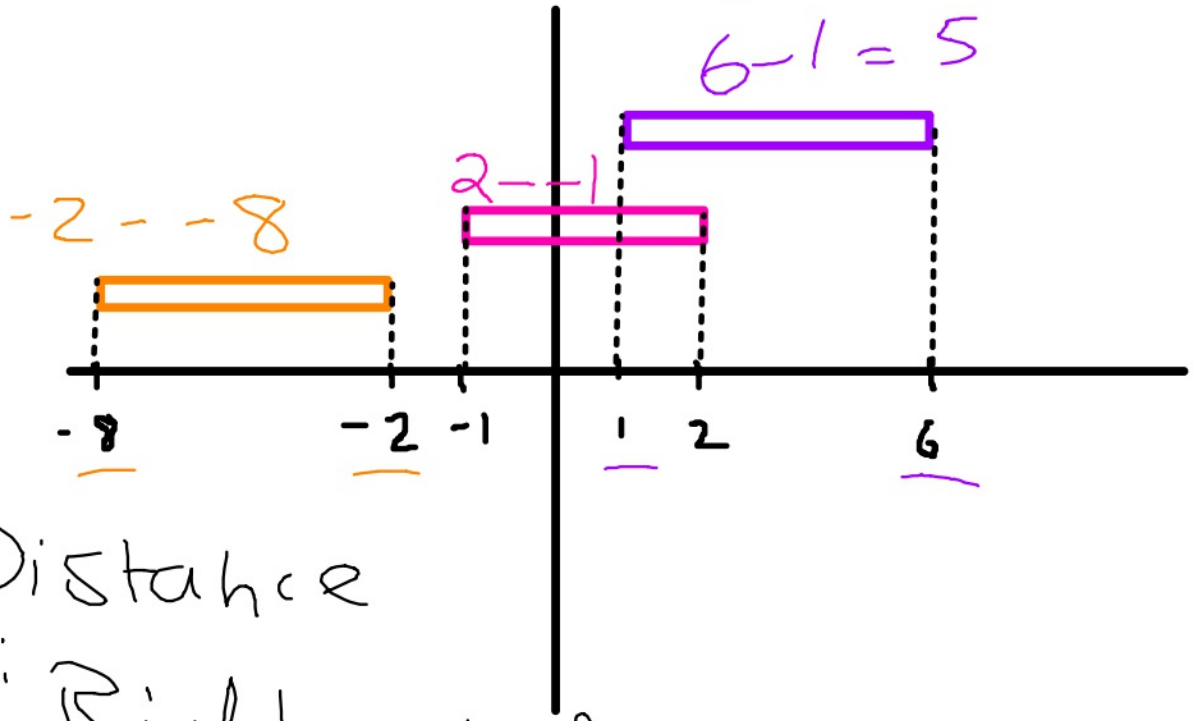
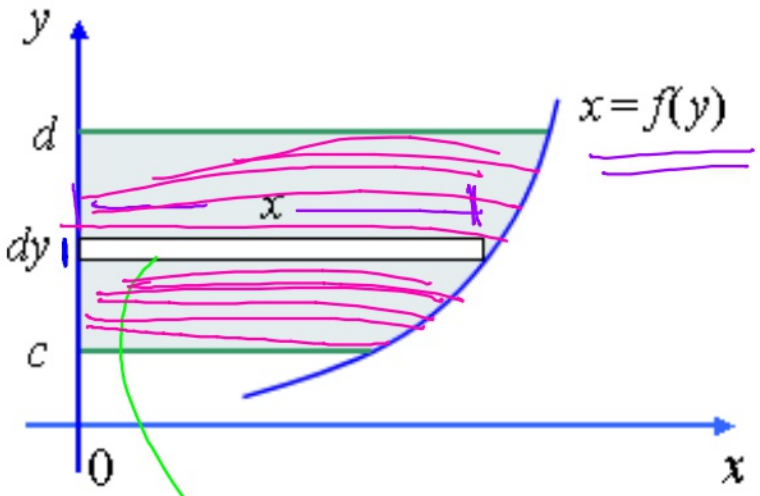
AP Calculus Mini lesson: "dy" area

How 'wide' are these rectangles?



Distance: Right − left.

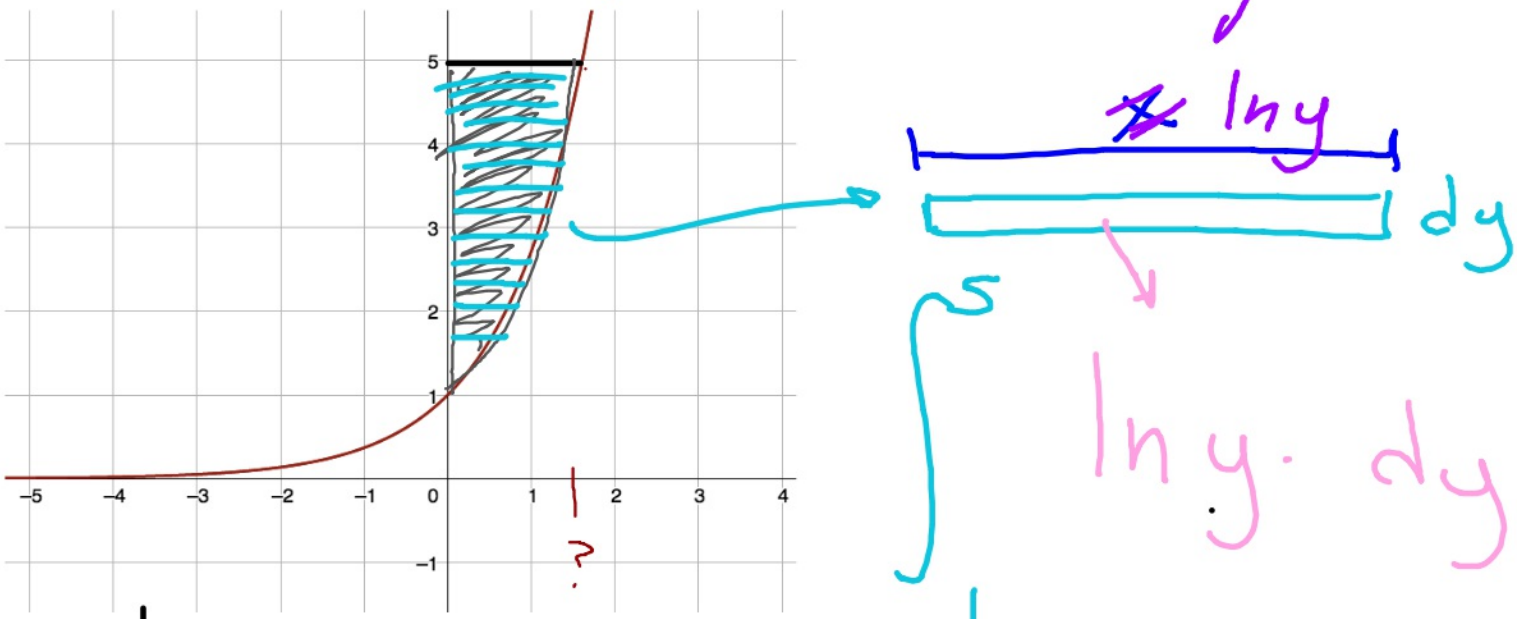


Area of rectangle:

width height

$$\int_c^d x \cdot dy$$

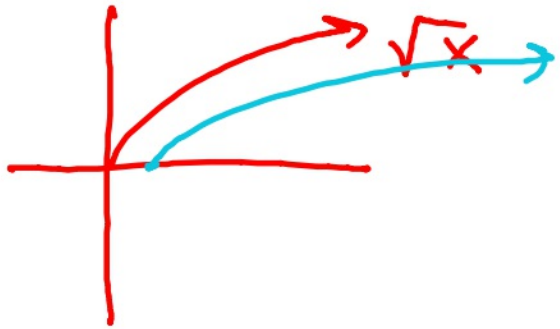
$$\int_c^d f(y) \cdot dy$$

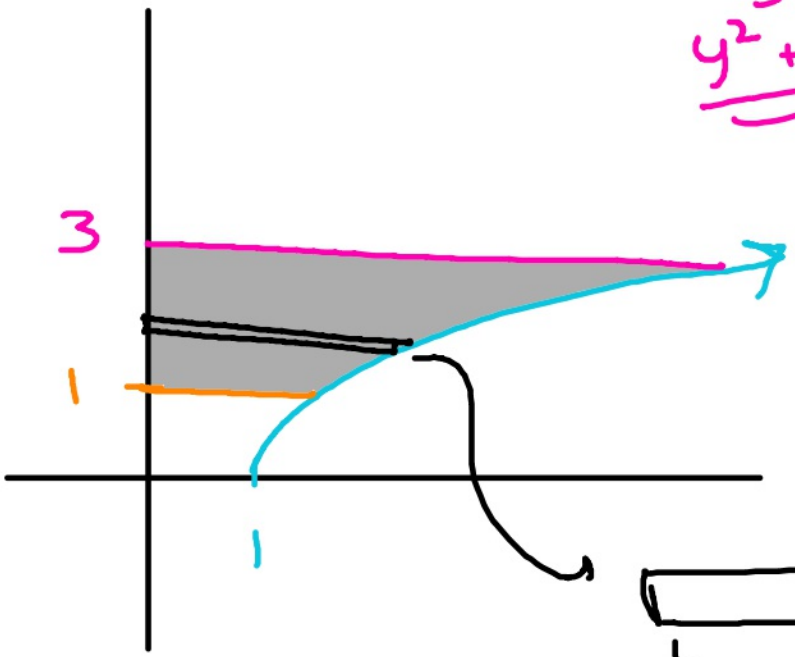

y=e^x → x=ln y
ln y
dy
∫ ln y · dy
1
?
d/dx [?] = ln x
≃ 4.047

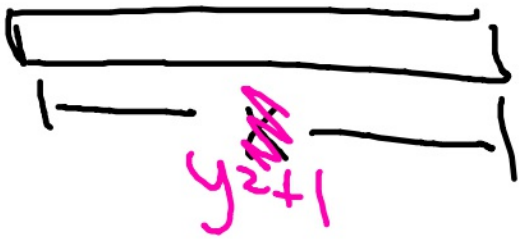
Find the area of the region bounded by $y = \sqrt{x-1}$ and the *horizontal* lines y=1 and y=3.

$y^2 = x - 1$

$y^2 + 1 = x$





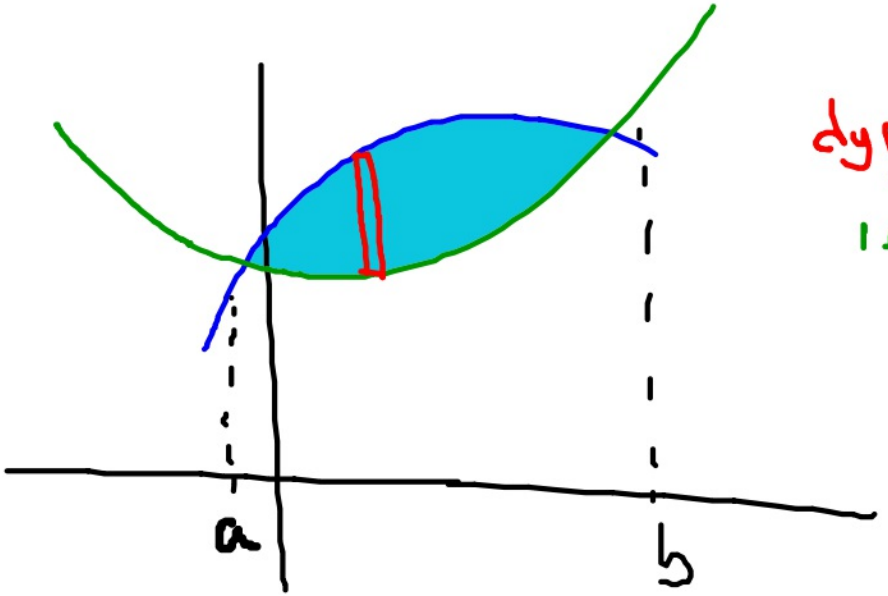


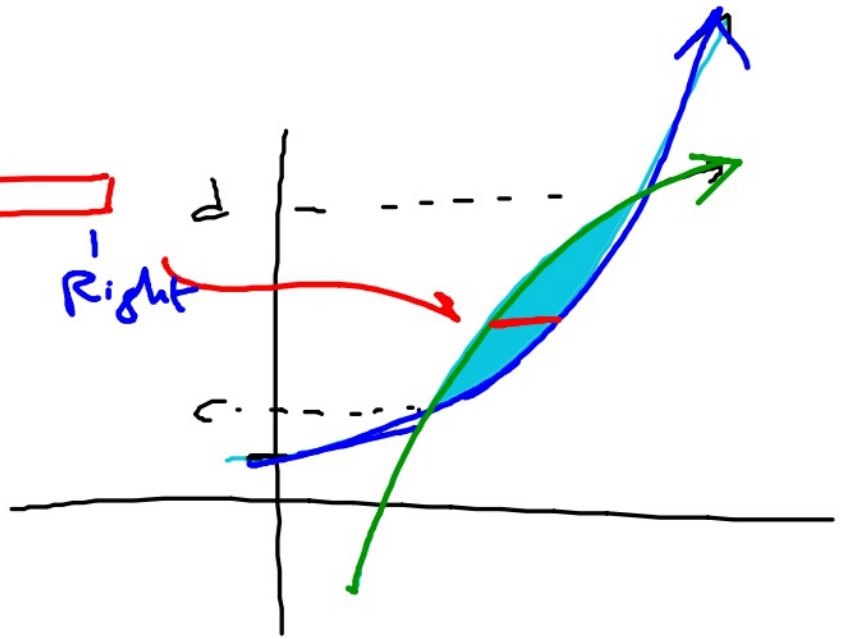
$$\int_1^3 \overbrace{y^2+1}^{\text{"x"}} \, dy$$

$$= \left[\frac{1}{3}y^3 + y\right]_1^3$$

$$(18+3) - \left(\frac{1}{3}+1\right)$$

Area Between Curves revisited

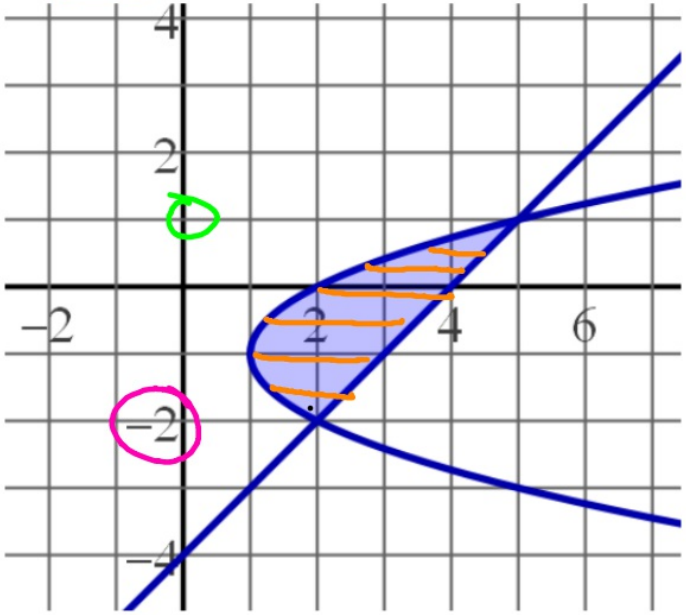




$$\int_a^b \text{top} - \text{bottom}\, dx$$

$$\int_c^d \text{right} - \text{left}\, dy$$

$x = y^2 + 2y + 2, \quad x = y + 4$



$$\int_{-2}^{1} \underbrace{(y+4)}_{\text{Right}} - \underbrace{(y^2+2y+2)}_{\text{left}} \cdot dy$$

$$\int_{-2}^{1} y+4-y^2-2y-2 \; dy$$

$$\int_{-2}^{1} (2-y-y^2)\, dy$$

$$\left[2y - \frac{1}{2}y^2 - \frac{1}{3}y^3\right]_{-2}^{1}$$

$= \#$