Math 1b (8:30 AM) 22 Jan 2020

Let the velocity of a bicycle (in ft/sec) (at time t sec) be given by

$$v(t) = e - e^t$$

Find the dispacement and distance traveled of the bike betwee $t = 0$ sec and $t = 2$ sec.

Displacement: $\int_0^2 (e - e^t)\,dt = et - e^t \Big|_0^2$

$= 2e - e^2 + 1$

Distance travelled

$e - e^t$ is zero when $t = 1$ $\int_0^2 |e - e^t|\,dt$

$$|e - e^t| = \begin{cases} e - e^t & t \le 1 \\ -(e - e^t) & t \ge 1 \end{cases}$$

$\int 7\,dt = 7t + c$

$\int e\,dt = et + c$

$$\int_0^1 (e - e^t)\,dt - \int_1^2 (e - e^t)\,dt$$

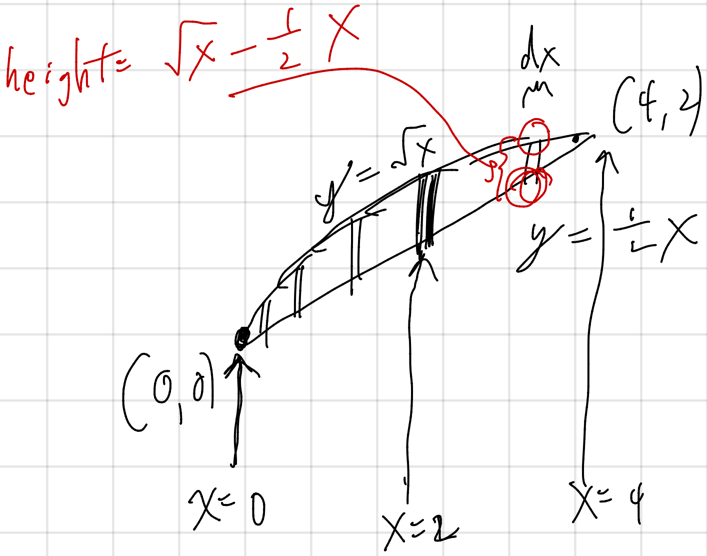
$$[et - e^t]_0^1 - [et - e^t]_1^2$$

$$(e - e + 1) - (e - e^2 + e)$$

$$(1) - (2e - e^2) = 1 - 2e + e^2$$

Section 6.1

Find the area between $y = \frac{1}{2}x$ and $y = \sqrt{x}$



Area between the curves

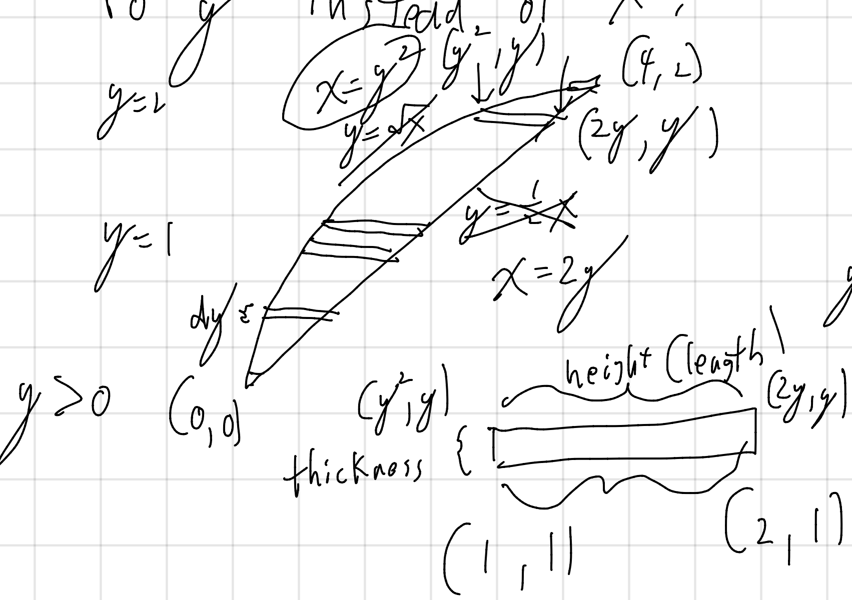
= sum of all rectangles

$$= \int_{x=0}^{x=4} \underbrace{\left(\sqrt{x} - \frac{1}{2}x\right)}_{\text{height}} \underbrace{dx}_{\text{thickness}}$$

Area of rectangle with horiz coord x

$$= \frac{2}{3}x^{3/2} - \frac{1}{4}x^2 \Big|_0^4 = \frac{16}{3} - 4 = \frac{4}{3}$$

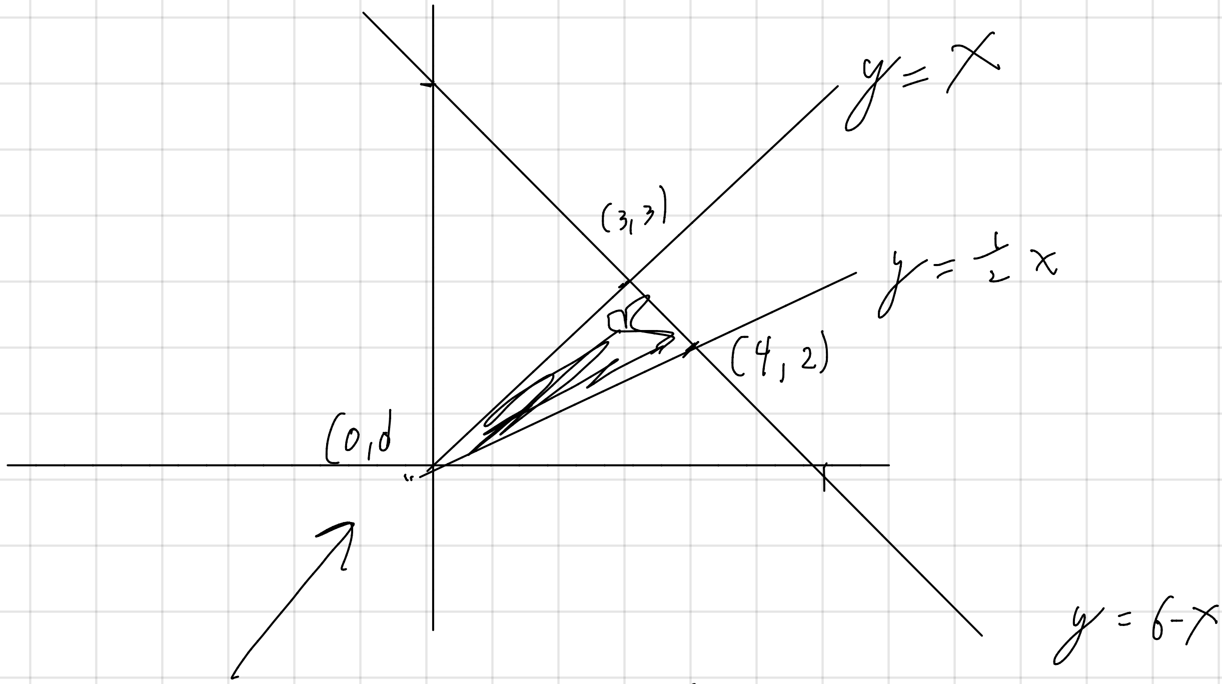
Find the above area using an integral with respect to y instead of x.



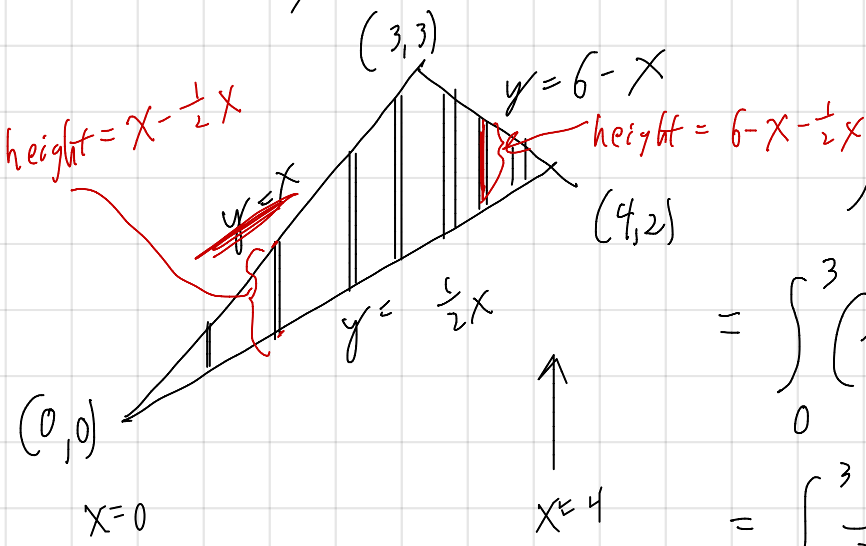
$$\int_{y=0}^{y=2} \underbrace{(2y - y^2)}_{\text{height (length)}} \underbrace{dy}_{\text{thickness}}$$

$$\left[y^2 - \frac{1}{3}y^3\right]_0^2$$

$$= 4 - \frac{8}{3} = \frac{12}{3} - \frac{8}{3} = \frac{4}{3}$$



What is the area of the triangle bound by these lines



$$\int_0^4 \overbrace{\qquad\qquad}^{\text{height}} \overbrace{dx}^{\text{thickness}}$$

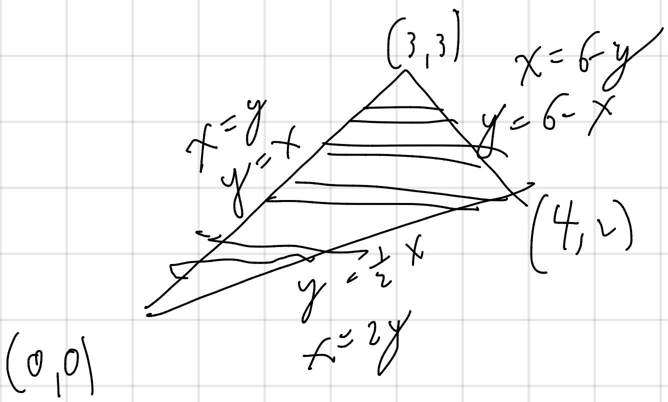
$$= \int_0^3 \left(x - \frac{1}{2}x\right) dx + \int_3^4 \left(6 - x - \frac{1}{2}x\right) dx$$

$$= \int_0^3 \frac{1}{2}x\,dx + \int_3^4 \left(6 - \frac{3}{2}x\right) dx$$

$$= \frac{1}{4}x^2 \Big|_0^3 + \left[6x - \frac{3}{4}x^2\right]_3^4$$

$$\frac{9}{4} + 6 - \frac{21}{4} = \frac{-12}{4} + 6 = 3$$

$$= 21$$



$$\int_{y=0}^{y=2} (2y - y)\, dy + \int_{y=2}^{y=3} (6 - y - y)\, dy$$

$$= \int_0^2 y\,dy + \int_2^3 (6 - 2y)\,dy = \frac{1}{2}y^2 \Big|_0^2 + \left[6y - y^2\right]_2^3 = 2 + 9 - 8$$

$$= 3$$