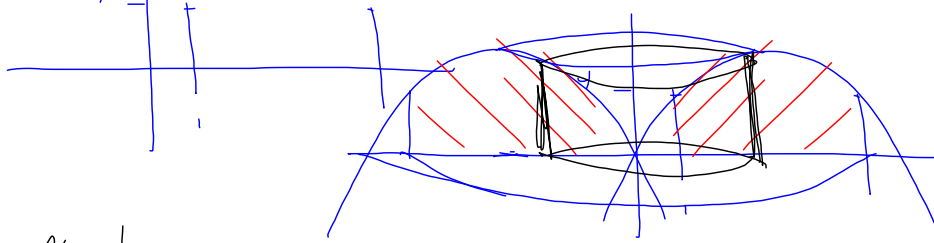
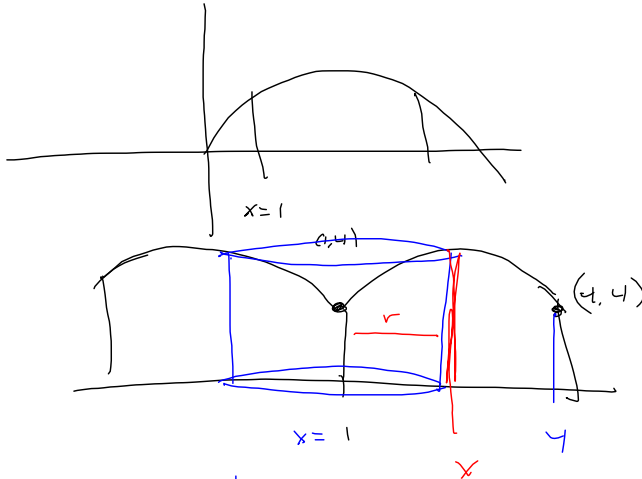


§ 5.3 $y = -x^2 + 5x$ about $x=1$, from

$x=1$ to $x=4$ $-x(x-5)$



About \uparrow



$$2\pi r h \Delta x$$

$$= 2\pi (x-1) f(x) \Delta x$$

$$= 2\pi (x-1)(-x^2+5x) \Delta x$$

$$\rightarrow 2\pi \int_1^4 (x-1)(-x^2+5x) dx$$

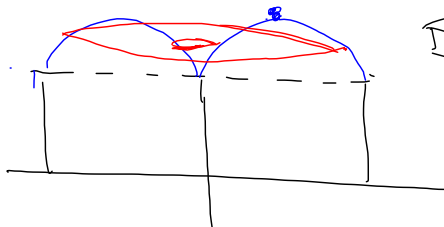


Set it up for washer method:

$$\pi \int r^2$$

~~scribble~~ $(\frac{5}{2}, \frac{25}{4})$

$$\pi r^2 h$$



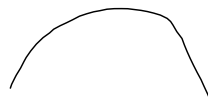
$$\int_4^{\frac{25}{4}} + \int_0^4$$

~~scribble~~

Volume = outer - inner

$$\pi r_1^2 h_1 - \pi r_2^2 h_2$$

$$= (\pi r_1^2 - \pi r_2^2) \Delta y, \text{ b/c } h_1 = h_2 = \Delta y$$



$$y = -x^2 + 5x = y$$

$$x^2 - 5x = -y$$

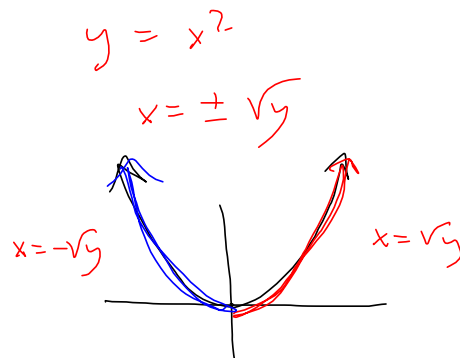
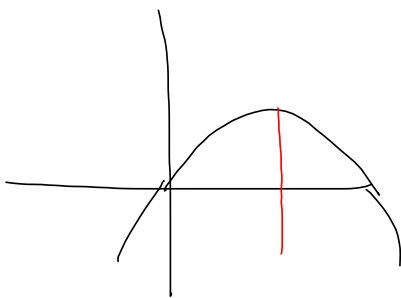
$$x^2 - 5x + \left(\frac{5}{2}\right)^2 = -y + \frac{25}{4}$$

$$\left(x - \frac{5}{2}\right)^2 = \frac{25}{4} - \frac{4y}{4} = \frac{25-4y}{4}$$

$$x - \frac{5}{2} = \pm \sqrt{\frac{25-4y}{4}} = \pm \frac{\sqrt{25-4y}}{2}$$

$$x = \frac{5}{2} \pm \frac{\sqrt{25-4y}}{2}$$

$$y = -x^2 + 5x$$



Invert $y = x^2 - 4x + 2$

(Solve for x in terms of y)

College algebra:

Swap x & y & solve for y

$$y = -x^2 + 5x$$

$$-y^2 + 5y = x$$

$$y = \frac{5}{2} \pm \sqrt{\frac{25-4x}{4}}$$

In calculus we
just go with
 $x = g(y)$

$$y = x^2 - 4x + 2 = y$$

$$x^2 - 4x = y - 2$$

$$x^2 - 4x + 2^2 = y - 2 + 4$$

$$(x-2)^2 = y + 2$$

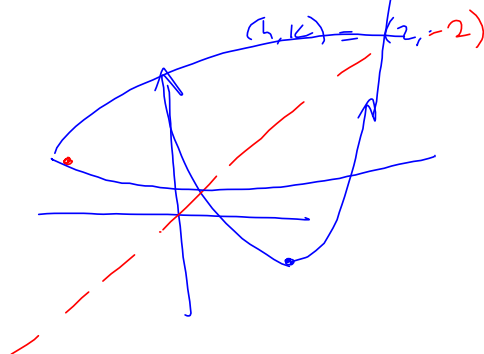
$$x-2 = \pm \sqrt{y+2}$$

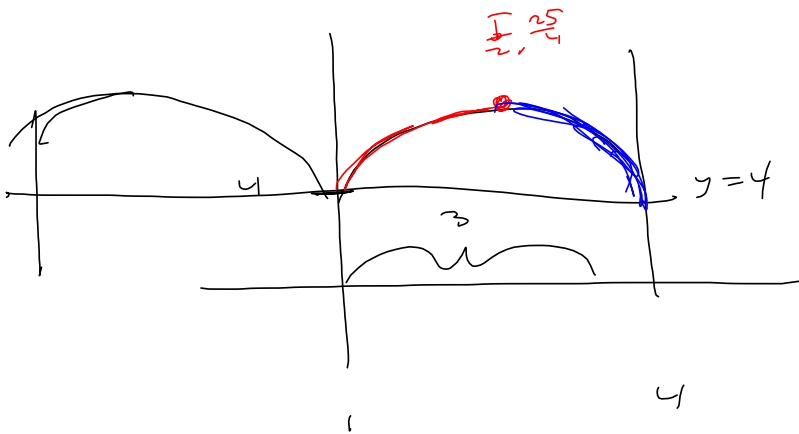
$$x = 2 \pm \sqrt{y+2}$$

$$y = x^2 - 4x + 2$$

$$= x^2 - 4x + 2^2 - 4 + 2$$

$$= (x-2)^2 - 2$$





$$\pi (3)^2 (4) + \int_1^4 \text{washers.}$$