$$\pi\int_2^5 f(x)^2\,dx = \pi\int_2^5 \sin x\,dx$$

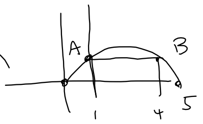
$$\sin x = f(x)^2$$

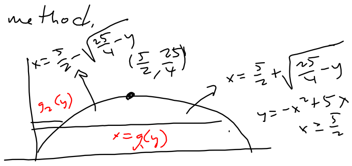
$y = -x^2+5x$ about $x=1$, from $x=1$ to $x=4$

Done by shell method.

Now by disc/washer method.

$A=(1,4)$
$B=(4,4)$





$-1^2+5(1)=4$

$$\pi\int_4^{25/4}\left(g_1(y)^2-g_2(y)^2\right)dy$$

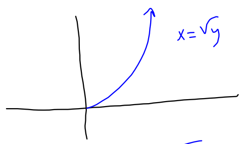
$$\begin{array}{r|rrr} \frac{5}{2} & -1 & 5 & 0 \\ & & -\frac{5}{2} & \frac{25}{4} \\ \hline & -1 & \frac{5}{2} & \frac{25}{4}=f(\frac{5}{2}) \end{array}$$

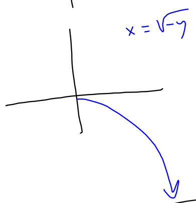
$$-y^2+5y = x$$
$$-\left(y^2-5y+\left(\tfrac{5}{2}\right)^2\right) = x-\tfrac{25}{4}$$
$$-\left(y-\tfrac{5}{2}\right)^2 = x-\tfrac{25}{4}$$
$$\left(y-\tfrac{5}{2}\right)^2 = -\left(x-\tfrac{25}{4}\right)$$
$$y-\tfrac{5}{2} = \pm\sqrt{-\left(x-\tfrac{25}{4}\right)}$$
$$y = \tfrac{5}{2}\pm\sqrt{-\left(x-\tfrac{25}{4}\right)}$$

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

$x=\sqrt{y}$
$x=\sqrt{-y}$
$x=\sqrt{-\left(y-\frac{25}{4}\right)}$

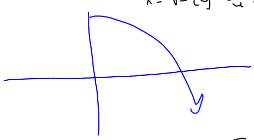
$x=\frac{5}{2}+\sqrt{-\left(y-\frac{25}{4}\right)}$ $\quad x=\sqrt{-\left(y-\frac{25}{4}\right)}+\frac{5}{2}$

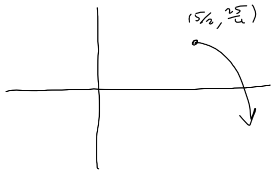


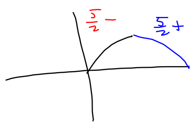


$\frac{5}{2}-\sqrt{-\left(y-\frac{25}{4}\right)}$

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







$$\pi\int_4^{25/4}\left[\left(\tfrac{5}{2}+\sqrt{-\left(y-\tfrac{25}{4}\right)}\right)^2-\left(\tfrac{5}{2}-\sqrt{-\left(y-\tfrac{25}{4}\right)}\right)^2\right]dy$$

$$\left(\tfrac{5}{2}\right)^2+2\left(\tfrac{5}{2}\right)\left(\sqrt{\sim}\right)+\left(-y-\tfrac{25}{4}\right)$$
$$-\left(\tfrac{5}{2}\right)^2+\left(2\left(\tfrac{5}{2}\right)\sqrt{\sim}\right)-\left(-\left(y-\tfrac{25}{4}\right)\right)$$
$$=2.5\sqrt{\sim}$$

$[\ \ ]$

$$10\pi \int_4^{\frac{25}{4}} \sqrt{\left(\frac{25}{4}-y\right)}\ dy = -10\pi \int_4^{\frac{25}{4}} \sqrt{\frac{25}{4}-y}\ (-dy)$$

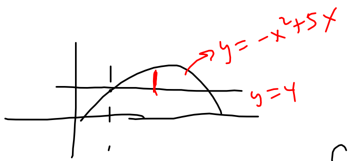
$u = \frac{25}{4} - y$

$du = -dy$

$$-10\pi \left[\frac{2}{3} \left(\frac{25}{4}-y\right)^{\frac{3}{2}} \right]_4^{\frac{25}{4}}$$

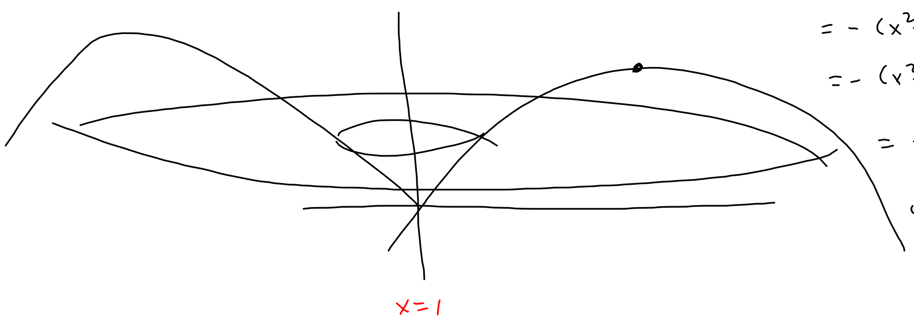
$$= \frac{-20\pi}{3} \left[0 - \left(\frac{25}{4} - \frac{16}{4}\right)^{\frac{3}{2}} \right]$$

$$= -\frac{20\pi}{3} \left[-\left(\frac{9}{4}\right)^{\frac{3}{2}} \right] = \frac{20\pi}{3} \left[\frac{3^3}{2^3} \right] = \frac{5}{2} \cdot \frac{3^2\pi}{1} = \frac{45\pi}{2}$$



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

$$= 2\pi \int_1^4$$



$y = -x^2+5x$

$= -(x^2 - 5x \quad)$

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

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

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

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

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

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

$$2\pi \int_a^b r\, f(x)\,dx = 2\pi \int_1^4 (x-1)(-x^2+5x-4)$$