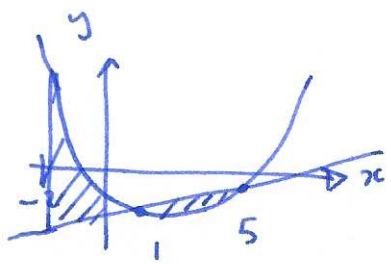
**Examples** • find area between graphs $f(x) = x^2 - 5x - 7$ on $[-2, 5]$ and $g(x) = x - 12$

draw picture:




← need to break into two integrals

intersection points: $x^2 - 5x - 7 = x - 12$

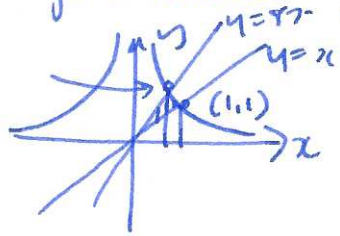
$x^2 - 6x + 5 = 0$

$(x-5)(x-1) = 0.$

• find area of region bounded by $y = \frac{1}{x^2}$, $y = x$, $y = 8x$

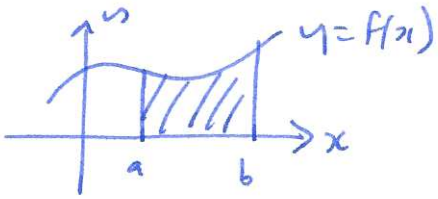
draw picture:

$(\frac{1}{2}, 4)$

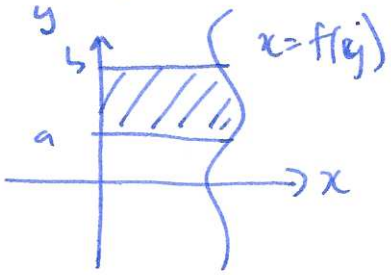



← need to break into two integrals

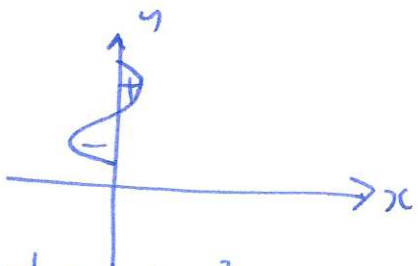
**Integration along y-axis** recall: $\int_a^b f(x)\,dx$



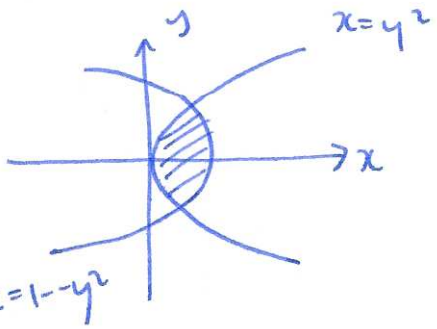

$\int_a^b f(y)\,dy$




signed area:




**Example** find area between the curves $x = y^2$ and $x = 1 - y^2$




intersection points $y^2 = 1 - y^2$ $2y^2 = 1$ $y = \pm \frac{1}{\sqrt{2}}$

$$\int_{-1/\sqrt{2}}^{+1/\sqrt{2}} 1 - y^2 - y^2\,dy$$

## §6.2 Volume, average value

recall: volume of cylinder is $Ah$


$A$ = area of base

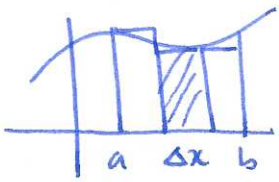
**Fact**: this works for cylinders of any base shape:

$V = Ah$

suppose shape is not a cylinder:

can approximate by horizontal slices

recall:




← can approximate area under curve by rectangles of width $\Delta x$