① $v(t) = \frac{1}{5t}$ on $1 \le t \le 7$ appox displacement w/ $n=3$ subint.

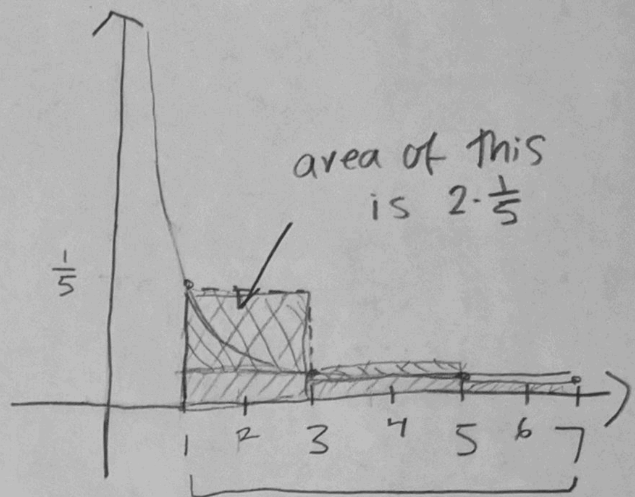
we can find the start/ending points of these intervals w/ $\frac{b-a}{n}$ where $7=b$ + $a=1$ so $\frac{b-a}{n} = \frac{7-1}{3} = 2$

then count that many steps starting at 1

$[1, 3, 5, 7]$ → 2, 4, 6

to visualize:

if we want to appoximate the area under this curve, we can instead take the value to be constant over some interval and simply count up the areas of the rectangles.



From the right:

displacement $= S(3) - S(1) = \int_1^3 v(t) \approx \boxed{2 \cdot \frac{1}{5} + 2 \cdot \frac{1}{15} + 2 \cdot \frac{1}{25}}$

From the left:

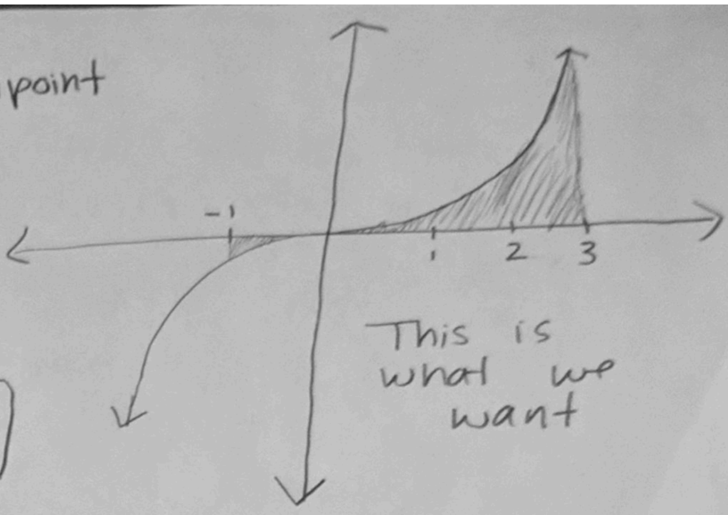
displacment $= \boxed{2 \cdot \frac{1}{15} + 2 \cdot \frac{1}{25} + 2 \cdot \frac{1}{35}}$

From middle: (use $X = \{2, 4, 6\}$)

$\boxed{2 \cdot \frac{1}{10} + 2 \cdot \frac{1}{20} + 2 \cdot \frac{1}{30}}$

(2) $f(t) = t^3$, $n=4$ midpoint

so for midpoint:
use $t = -0.5, 0.5, 1.5, 2.5$



This is what we want

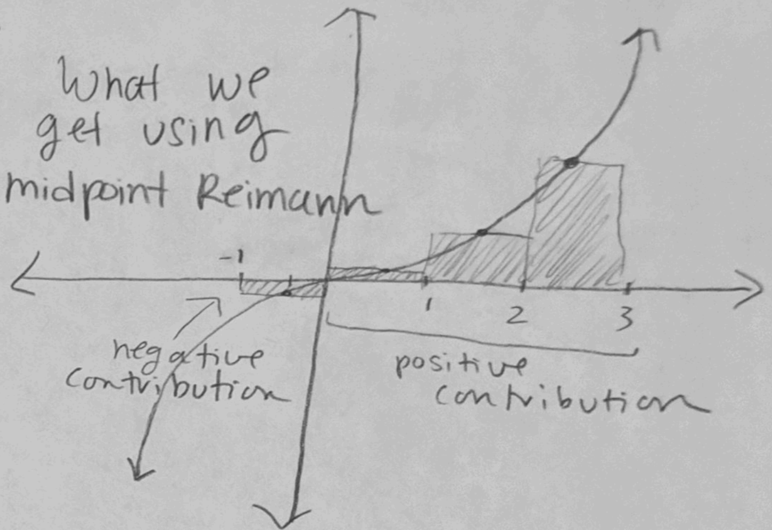
(b) net area ≈

$$\boxed{-0.5^3 + 0.5^3 + 1.5^3 + 2.5^3}$$

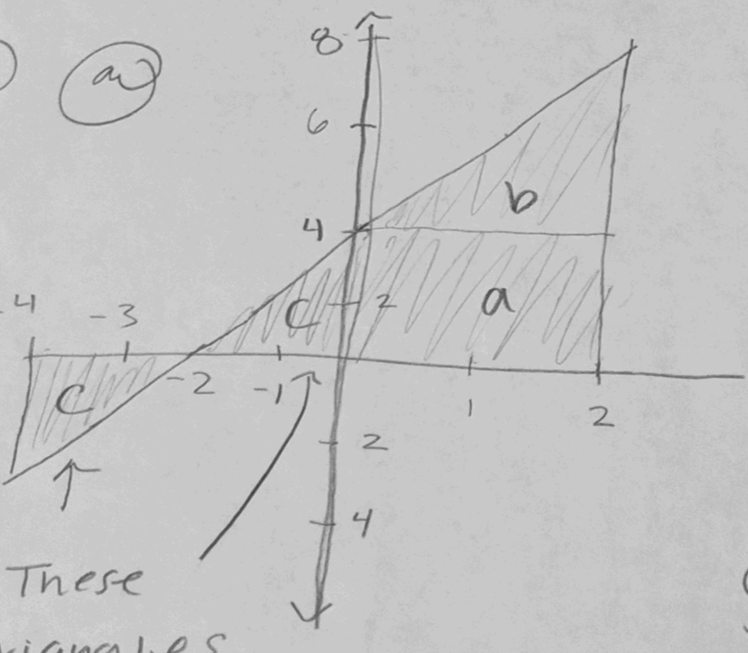
↑ ↑ ↑ ↑

These each represent the areas of one of the rectangels on your right.

What we get using midpoint Reimann



(3) (a)



These triangles cancel each other out

$$\int_{-4}^{2} (2x+4)\,dx = -c + c + a + b$$

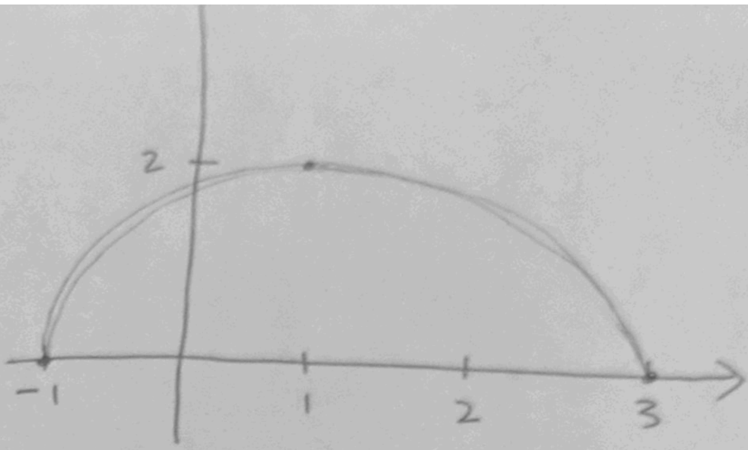
$a = 2 \cdot 4$ and

$b = \frac{1}{2}(2 \cdot 4)$ so

$$\int_{-4}^{2} (2x+4)\,dx = 8 + 4 = \boxed{12}$$

(b) $\int_{-1}^{3} \sqrt{4-(x-1)^2}\,dx$

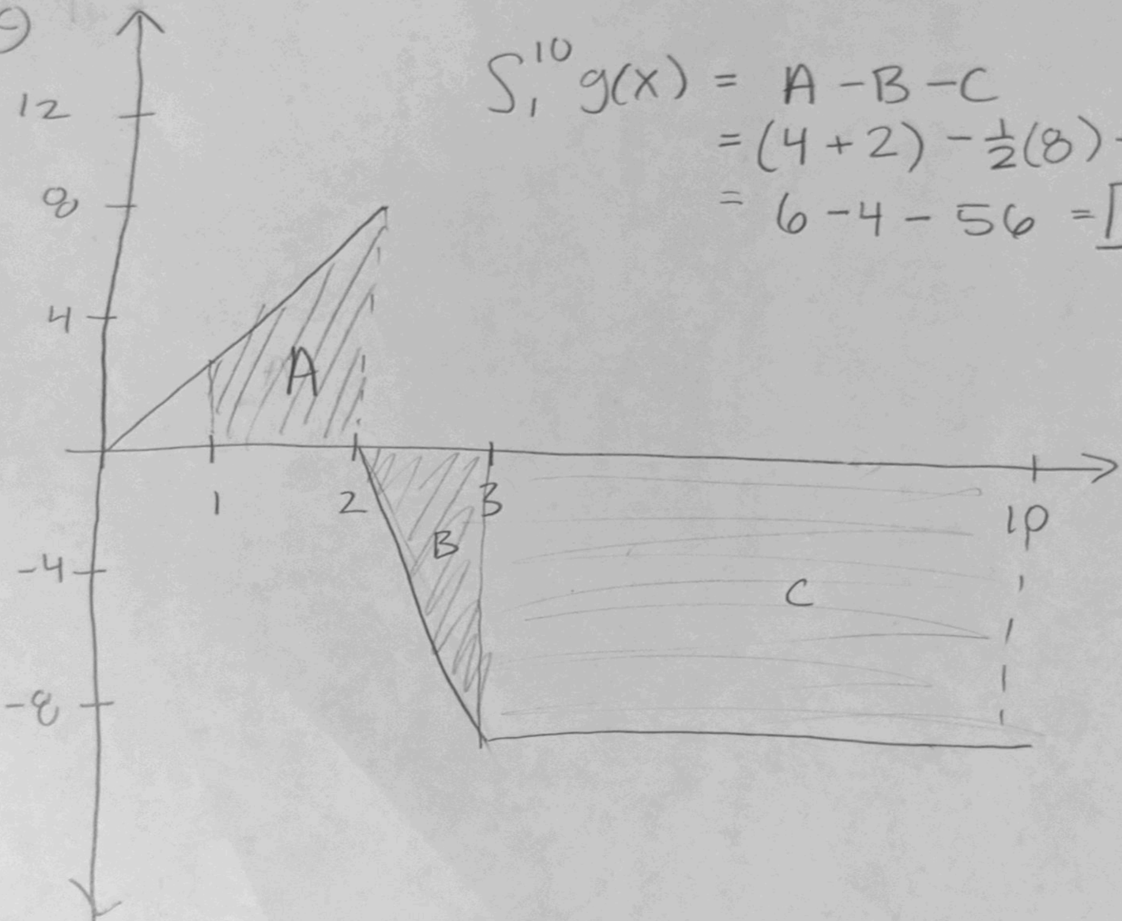
it's a circle!
(well, half of one



Area $= \frac{1}{2}(\pi r^2)$
$= \frac{1}{2}(4\pi) = \boxed{2\pi}$

$$\boxed{\int_{-1}^{3} \sqrt{4-(x-1)^2}\,dx = 2\pi}$$

(c)



$\int_{1}^{10} g(x) = A - B - C$
$= (4+2) - \frac{1}{2}(8) - (8\cdot 7)$
$= 6 - 4 - 56 = \boxed{54}$