

Announcements

6

• OH Friday: 10am - 11am (reg. time)

• HW 9 out; due Next Wed.

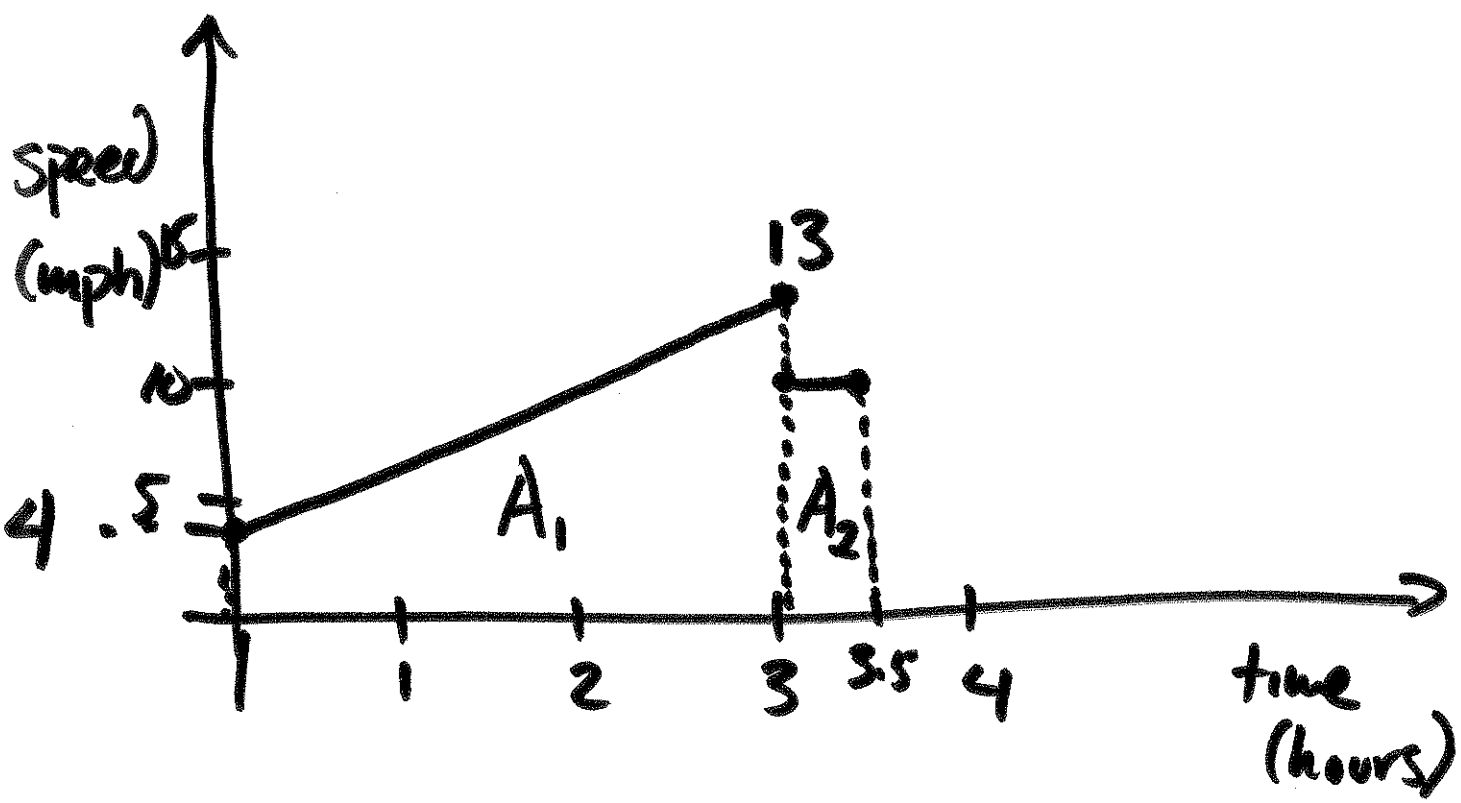
• Quiz 9 in class next Friday

WARM UP:

At time $t = 0$ hours, a sailboat picks up a growing wind and travels at a speed of $4 + 3t$ mph.

After 3 hours, the wind dies down and the boat travels at 10 mph for 30 minutes. How far does the boat travel?

Soln:



• Distance = $A_1 + A_2$

$$= \frac{h}{2}(L_1 + L_2) + 10 \cdot \frac{1}{2}$$

$$= \frac{3}{2}(4 + 13) + 5$$

$$= \frac{3}{2} \cdot 17 + 5 = \frac{51}{2} + 5$$

$$= \boxed{30.5 \text{ miles}}$$

= Using 4 rectangles, give the

(a) L.H. sum approx

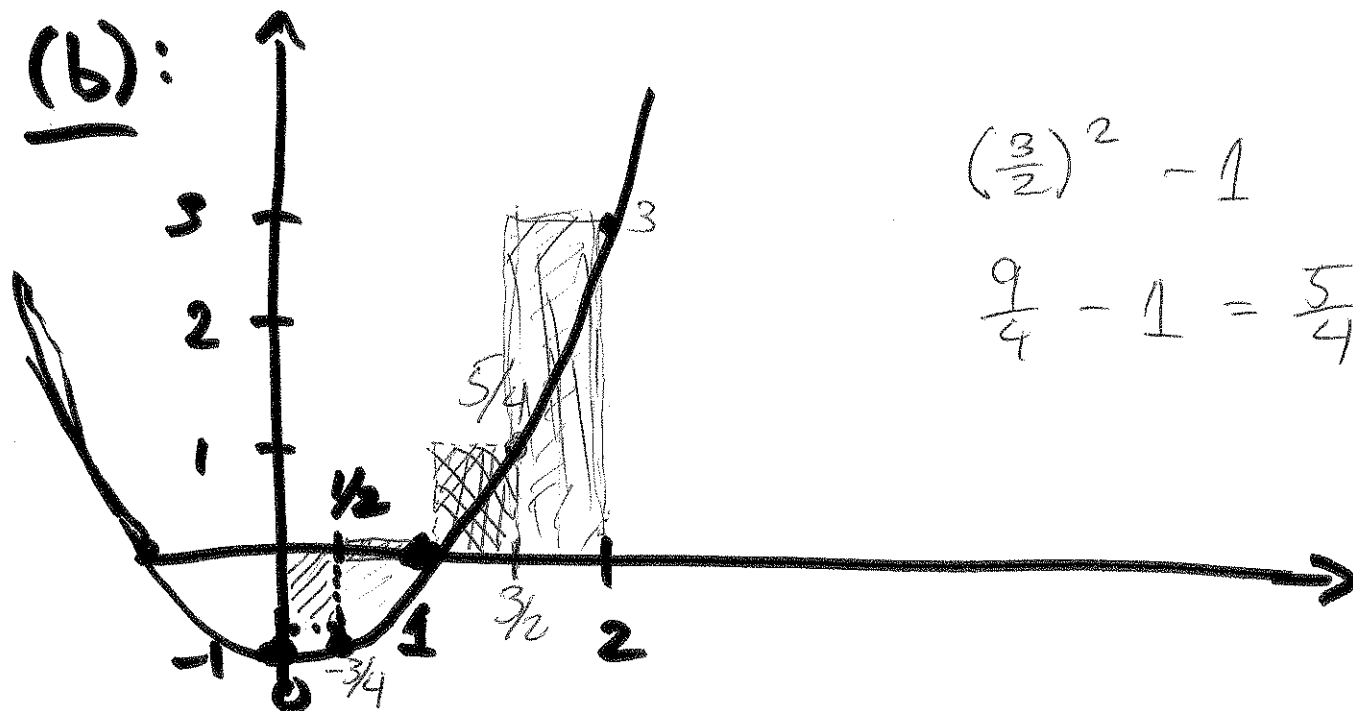
(b) R.H. sum approx

to $\int_0^2 x^2 - 1 dx$.

(2)

(a): See Monday's notes

(b):



$$\left(\frac{3}{2}\right)^2 - 1$$

$$\frac{9}{4} - 1 = \frac{5}{4}$$

$n=4$, $\Delta x = \text{width of rectangles} = \frac{b-a}{n}$

$$= \frac{2-0}{4} = \frac{1}{2}$$

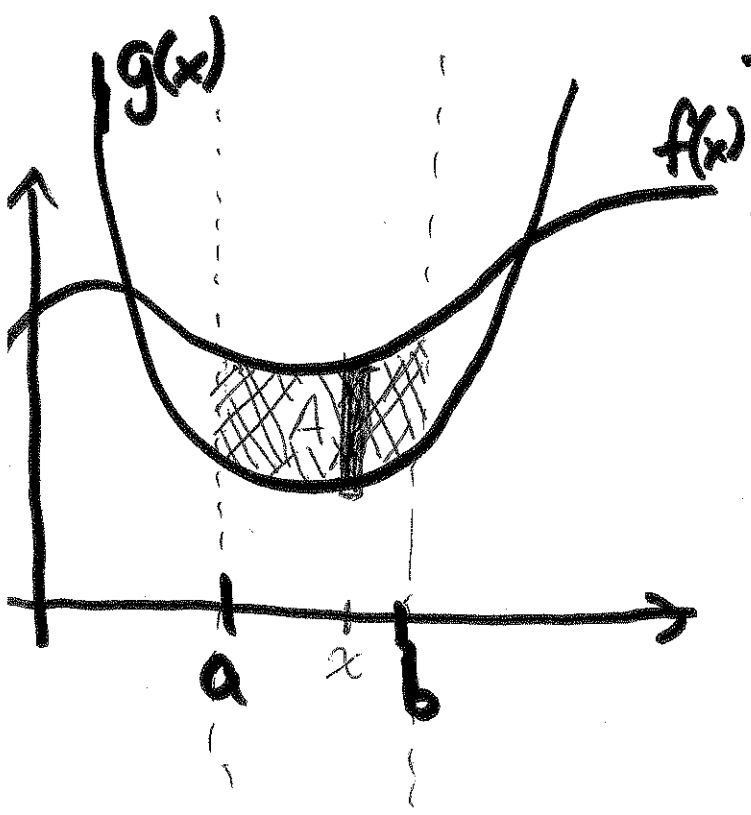
RH Sum: $\frac{-3}{4} \cdot \frac{1}{2} + 0 \cdot \frac{1}{2} + \frac{5}{4} \cdot \frac{1}{2} + 3 \cdot \frac{1}{2}$

$$= -\frac{3}{8} + 0 + \frac{5}{8} + \frac{12}{8}$$

$$= \frac{14}{8} = \boxed{\frac{7}{4}} \text{ (upper bound on area)}$$

5.3 Area between Curves

• If $f(x) \geq g(x)$ for x in $[a, b]$, then the area of



the region between
 the graph of f
 and the graph of
 g ~~for x in~~ $[a, b]$
 over
 is given by

$$\int_a^b (f(x) - g(x)) dx$$

height of
 rectangles

"width" of
 Rectangles

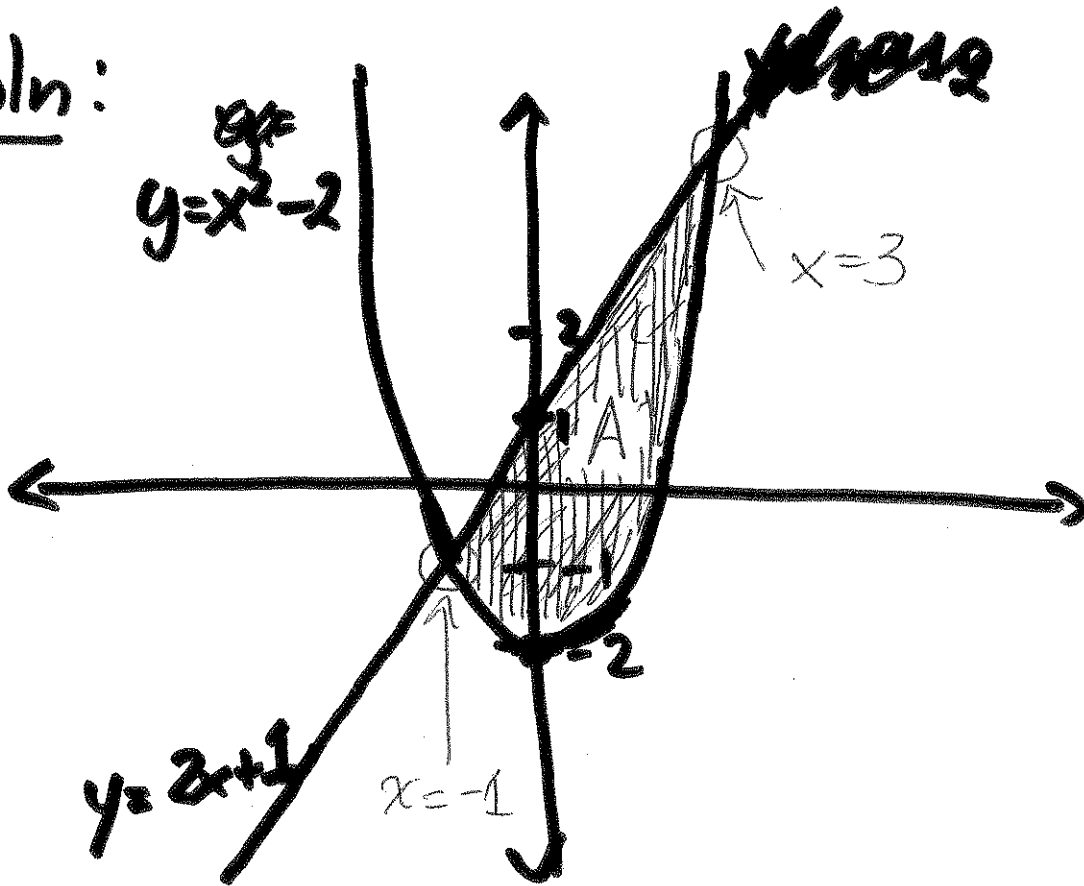
(4)

Ex: Express the area of the region bounded by

$$y = x^2 - 2 \quad \text{and} \quad y = 2x + 1$$

as a definite integral.

Soln:



$$\text{Area} = \int (2x+1) - (x^2-2) dx$$

• Find the pts of intersection. (5)

• Solve for x in $x^2 - 2 = 2x + 1$

$$x^2 - 2x - 3 = 0$$

$$(x + 1)(x - 3) = 0$$

$$x + 1 = 0 \quad \text{or} \quad x - 3 = 0$$

$$x = -1 \quad \text{or} \quad x = 3$$

• Area = $\int_{-1}^3 (2x + 1) - (x^2 - 2) dx$