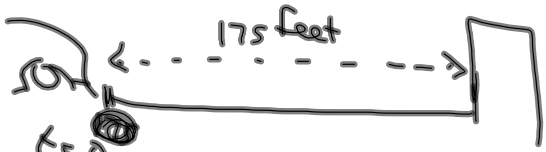
Warm UP

The brakes of a car decelerate the car at 22 ft./s^2 The car is travelling at 60 mph and applies the brakes 175 feet from a concrete barrier. Should we call 911? 1 mile = 5280 feet

$$60\,mph \times \frac{5280\,ft.}{1\,mile} \times \frac{1\,h}{3600\,sec} = \underline{88\,ft./sec}$$



$t = 0$
$v = 88$
$s = 0$

$a = -22$

$v = -22t + C$

$\boxed{v = -22t + 88}$

$s = -11t^2 + 88t + C$

$\boxed{s = -11t^2 + 88t}$

Stops...

$v = 0$

$0 = -22t + 88$

$-88 = -22t$

$\underline{t = 4\,sec}$

$s(4) = -11(4)^2 + 88(4)$

$= \underline{176}$ feet

Car will require 176 feet to stop...
will strike barrier with Low impact

$-11t^2 + 88t = 175$

$-11t^2 + 88t - 175 = 0$

$$t = \frac{-88 \pm \sqrt{(88)^2 - 4(-11)(-175)}}{2(-11)}$$

$$t = \frac{-88 \pm 6.63}{-22}$$

~~t = 4.3 sec~~ $\underline{3.7\,sec}$

$V = -22(3.7) + 88$

$\underline{V = 6.63\,ft/sec}$

4. $f''(x) = -10x^2 - 2$ $\quad f'(0) = 5$

$f(1) = \frac{79}{6}$

$f'(x) = -\frac{10}{3}x^3 - 2x + C$

$f'(x) = -\frac{10}{3}x^3 - 2x + 5$

$f(x) = -\frac{5}{6}x^4 - x^2 + 5x + C$

$\frac{79}{6} = -\frac{5}{6} - 1 + 5 + C$

$\frac{79}{6} = \frac{19}{6} + C$

$\frac{60}{6} = C$

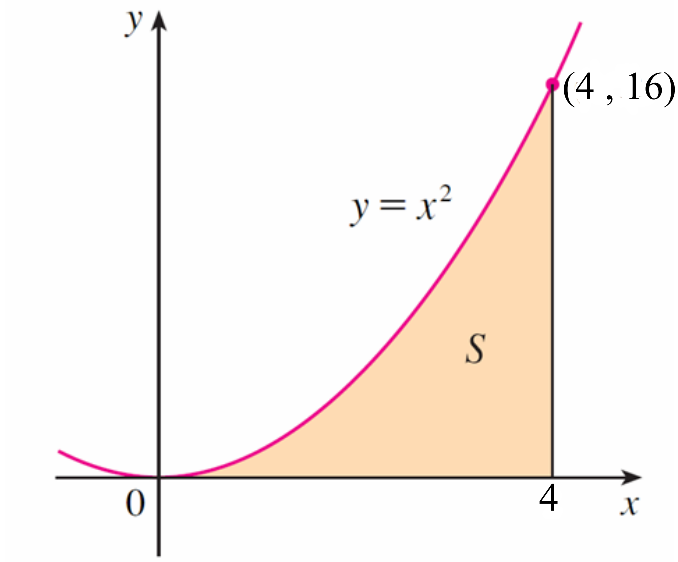
$10 = C$

$f(x) = -\frac{5}{6}x^4 - x^2 + 5x + 10$

$f(0) = 0 + 0 + 0 + 10$

$= \underline{\underline{10}}$

Introduction...

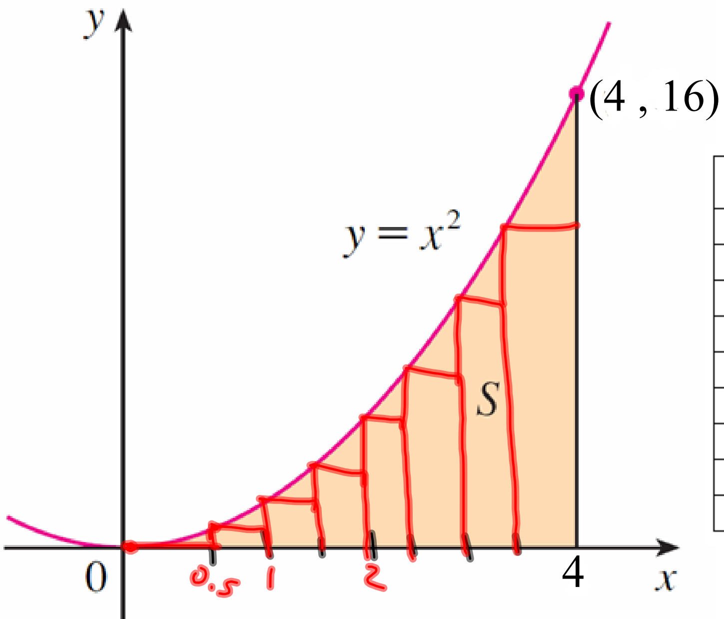


x	$f(x)$
0	0
0.5	0.25
1	1
1.5	2.25
2	4
2.5	6.25
3	9
3.5	12.25
4	16

(1) Determine the area of region S by using the **left** endpoints of 8 equal subintervals.

(2) Determine the area of region S by using the **right** endpoints of 8 equal subintervals.

(3) Determine the area of region S by using 8 subintervals and the **trapezoidal rule**.



x	$f(x)$
0	0
0.5	0.25
1	1
1.5	2.25
2	4
2.5	6.25
3	9
3.5	12.25
4	16

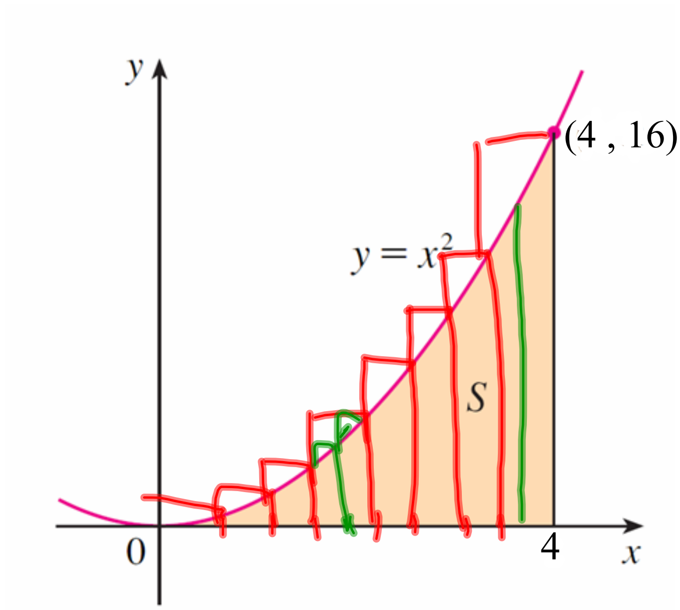
(1) Determine the area of region S by using the **left** endpoints of 8 equal subintervals.

$$A = \left(\tfrac{1}{2} \times h_1\right) + \left(\tfrac{1}{2} \times h_2\right) + \left(\tfrac{1}{2} \times h_3\right) + \cdots + \left(\tfrac{1}{2} \times h_8\right)$$

$$A = \tfrac{1}{2}\left(h_1 + h_2 + h_3 + \cdots h_8\right)$$

$$A = \tfrac{1}{2}\left(0 + 0.25 + 1 + 2.25 + 4 + 6.25 + 9 + 12.25\right)$$

$$\underline{A = 17.5\,u^2} \quad (\text{underestimate})$$



x	$f(x)$
0	0
0.5	0.25
1	1
1.5	2.25
2	4
2.5	6.25
3	9
3.5	12.25
4	16

(2) Determine the area of region S by using the **right** endpoints of 8 equal subintervals.

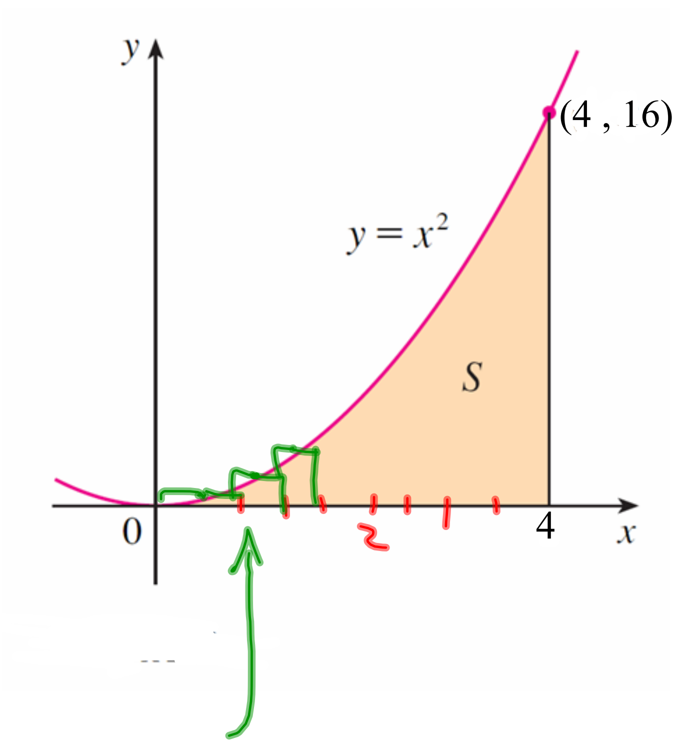
$A = \frac{1}{2}(0.25 + 1 + 2.25 + 4 + 6.25 + 9 + 12.25 + 16)$

$A = \frac{1}{2}(51)$

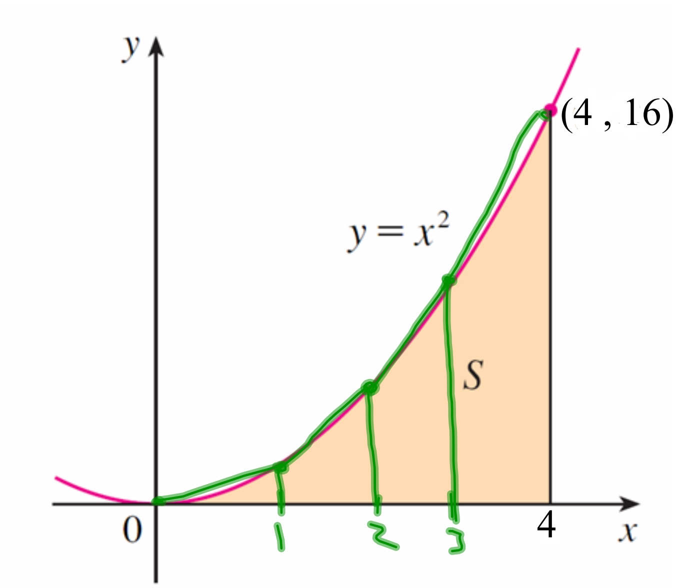
$A = 25.5\,u^2$ (overestimate)

Average ... $\dfrac{25.5 + 17.5}{2}$

$= 21.5$

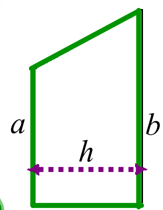


Use Midpoints...



x	$f(x)$
0	0
0.5	0.25
1	1
1.5	2.25
2	4
2.5	6.25
3	9
3.5	12.25
4	16

(3) Determine the area of region S by using ~~8~~ 4 subintervals and the **trapezoidal rule**.



$$A = \frac{1}{2}(a+b)h$$

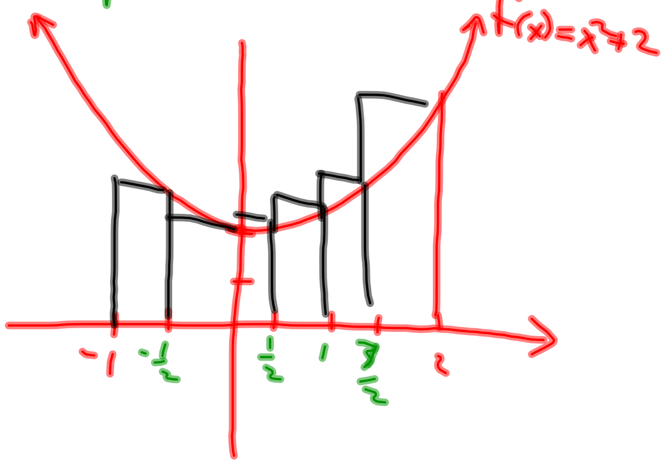
$$A = \frac{1}{2}(1)\left[(0+1)+(1+4)+(4+9)+(9+16)\right]$$

$$\underline{A = 22u^2}$$

ex. $f(x) = x^2 + 2$

estimate area below $f(x)$ & above x-axis between $x = -1$ and 2 using ...

(I) Right-endpoints
(II) Trapezoidal Rule
} 6 equal sub-intervals



(I)

$A = \frac{1}{2}[2.25 + 2 + 2.25 + 3 + 4.25 + 6)$

$A = \underline{9.875\ u^2}$

(II) $A = \frac{1}{2}\left(\frac{1}{2}\right)\left[(3+2.25) + (2.25+2) + (2+2.25) + (2.25+3) + (3+4.25) + (4.25+6)\right]$

$A = \underline{9.125}\ u^2$