4.2 Summations and Area

Objective: You will be able to:

- use sigma notation to write and evaluate a sum
- use rectangles to approximate the area under a curve

(upper bound)

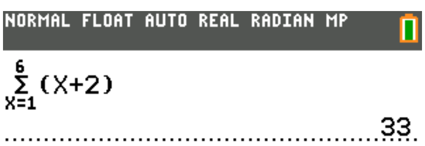
$$\sum_{i=1}^{6} i + 2$$

index of summation (lower bound)

Sigma (Sum)

$1+2 + 2+2 + 3+2 + 4+2 + 5+2 + 6+2$

$3 + 4 + 5 + 6 + 7 + 8$



Use sigma notation to write:

$$\frac{5}{1+1} + \frac{5}{1+2} + \frac{5}{1+3} + \dots + \frac{5}{1+15}$$

$$\sum_{i=1}^{15} \frac{5}{1+x}$$

Use sigma notation to write:

2(1) - 3 + 2(2) - 3 + 2(3) - 3 + ... + 2(35) - 3

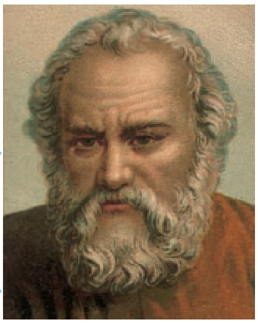
Use a calculator to evaluate the sum.

sum (seq (2x - 3, x, 1, 35))
list, math list, ops

Newer version

alpha F2

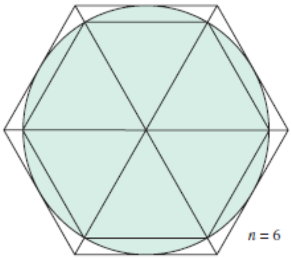
summation

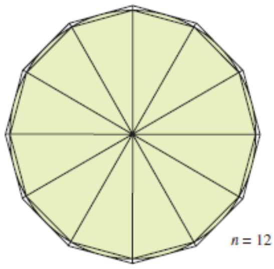


Mary Evans Picture Library

ARCHIMEDES (287–212 B.C.)

Archimedes used the method of exhaustion to derive formulas for the areas of ellipses, parabolic segments, and sectors of a spiral. He is considered to have been the greatest applied mathematician of antiquity.





$n=6$ $n=12$

The area under a curve can be approximated using summations.

https://www.geogebra.org/m/H4v6Dk4Y

change to this f(x) $n=5$

$8 - 0.25x^2$

Calculus the Muscial: Without Riem

Calculus in Motion:

Riemann.gsp

https://www.geogebra.

Geometry in Calculus...

slope $\frac{dy}{dx} = f(x)$

area $\int dy = \int f(x)\, dx$

height base

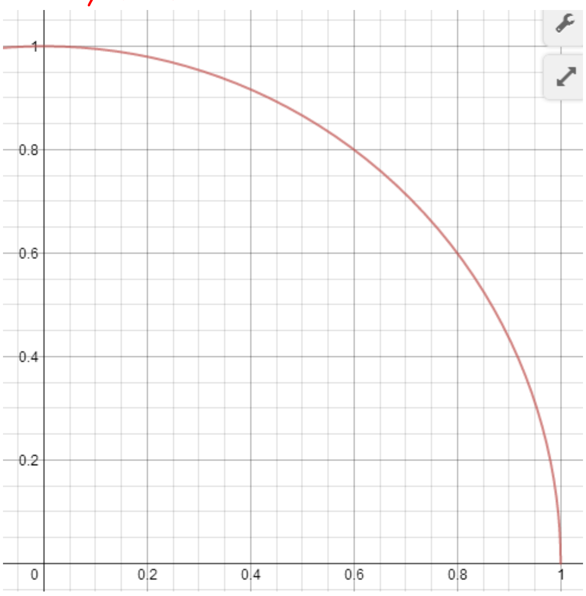
$\sum f(x)\, \Delta x$

Use left hand, right hand sums, and midpoint to approximate the area of the region using 5 subintervals of equal width from (0, 1)

$\frac{1-0}{5} = .2$

you must clearly show the following process on your hw!!

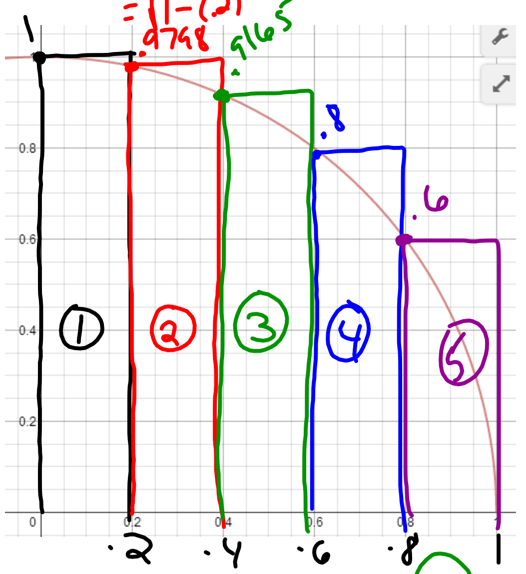
$$y = \sqrt{1 - x^2}$$



$$y = \sqrt{1 - x^2}$$

left hand sums:

$= \sqrt{1-(.2)^2}$



NORMAL FLOAT AUTO REAL RADIAN MP

X	Y1
0.2	0.9798
0.4	0.9165
0.6	0.8
0.8	0.6

slopX= dx

area $\int dy = \int f(x)\,dx$

height base

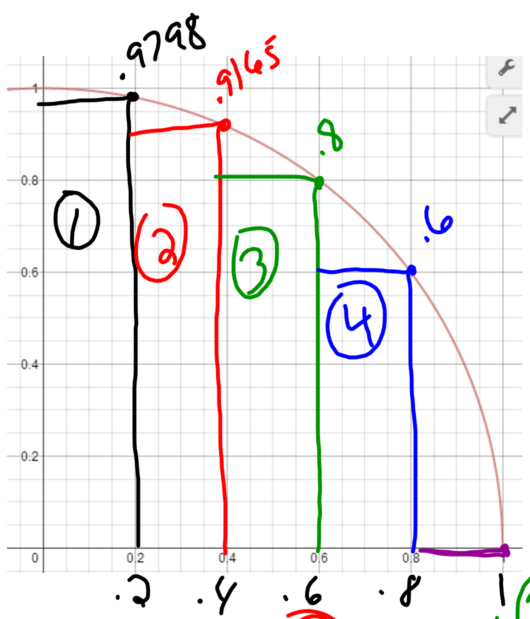
1 + 2 + 3 + 4 + 5

$.2(1) + .2(.9798) + .2(.9165) + .2(.8) + .2(.6)$

$.2(1 + .9798 + .9165 + .8 + .6)$

$$y = \sqrt{1 - x^2}$$

right hand sums:



NORMAL FLOAT AUTO REAL RADIAN MP

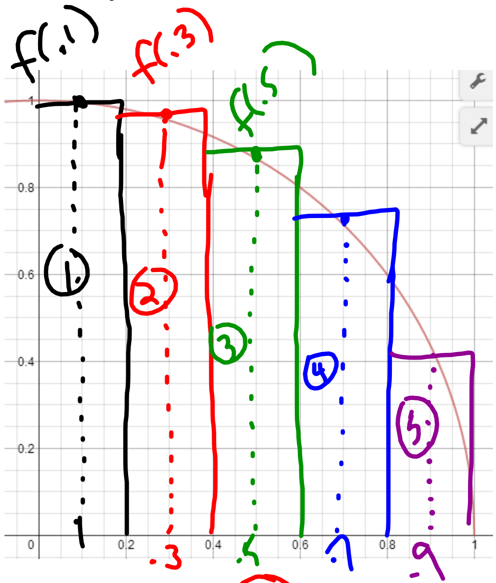
Y1(.2)
.9797958971
Y1(.4)
.916515139
Y1(.6)
.8
Y1(.8)
.6

1 + 2 + 3 + 4

$.2(.9798) + .2(.9165) + .2(.8) + .2(.6) + .2(0)$

$$y=\sqrt{1-x^2}$$

midpoint




```
NORMAL FLOAT AUTO REAL RADIAN MP
Y1(.1)
                .9949874371
Y1(.3)
                .9539392014
Y1(.5)
                .8660254038
Y1(.7)
                .7141428429
Y1(.9)
                .4358898944
```

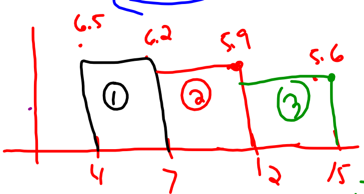
① + ② + ③ + ④ + ⑤

$.2(.995)+.2(.9539)+.2(.866)+.2(.7141)+.2(.4359)$

t (hours)	4	7	12	15
$R(t)$ (liters/hour)	6.5	6.2	5.9	5.6

8. A tank contains 50 liters of oil at time $t = 4$ hours. Oil is being pumped into the tank at a rate $R(t)$, where $R(t)$ is measured in liters per hour, and t is measured in hours. Selected values of $R(t)$ are given in the table above. Using a right Riemann sum with three subintervals and data from the table, what is the approximation of the number of liters of oil that are in the tank at time $t = 15$ hours?

(A) 64.9 (B) 68.2 (C) 114.9 (D) 116.6 (E) 118.2



$3(6.2)+5(5.9)+3(5.6)$

$18.6+29.5+16.8$

18.6
29.5
16.8
64.9
+50
114.9

8	C

6.2 × 3 = 18.6

5.9 × 5 = 29.5

5.6 × 3 = 16.8

Attachments

Riemann.gsp