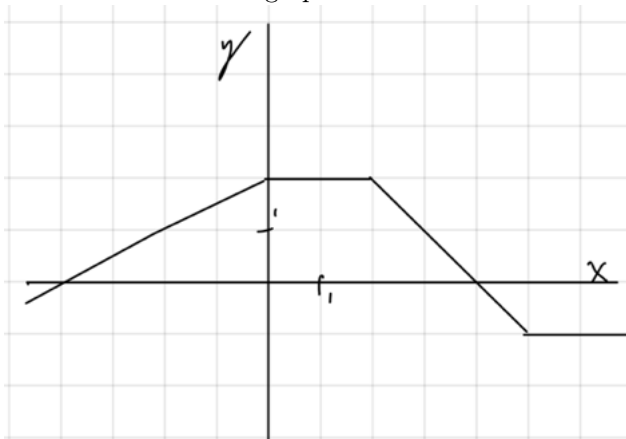


- (1) Consider the function graphed below.



(a) Evaluate $\int_{-4}^6 f(x) dx$

(b) Evaluate $\int_6^{-4} f(x) dx$

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(c) Write a left Riemann sum with $n = 5$ subdivisions for $\int_{-4}^6 f(x) dx$

(d) Write a Riemann sum using midpoints with $n = 5$ subdivisions for $\int_{-4}^6 f(x) dx$ subdivisions.

- (2) Consider the integral

$$\int_{-2}^2 \frac{1}{1+x^2} dx$$

- (a) Write out the Riemann sum with $n = 8$ subdivisions using left sample points for the above integral. You do not need to evaluate or simplify the sum. Is this sum greater than or less than the integral?

- (b) Write out the Riemann sum with $n = 8$ subdivisions using right sample points for the above integral. You do not need to evaluate or simplify the sum. Is this sum greater than or less than the integral?

- (c) Write out the Riemann sum with $n = 8$ subdivisions using midpoint sample points for the above integral. You do not need to evaluate or simplify the sum.

- (d) Write out the limit definition for the above integral. You may use left or right hand sums, whichever you like.

- (3) A bicycle travels along a straight road. Let

$p(t)$ = The position of the bicycle (in feet) at time t (in seconds)

$v(t)$ = The velocity of the bicycle (in feet/sec) at time t (in seconds)

- (a) Suppose $\int_{30}^{60} v(t) dt = 400$. What does this mean? Give a complete sentence using units as appropriate.
- (b) Suppose $p(20) = 200$. What does this mean? Give a complete sentence using units as appropriate.
- (c) Suppose $p(40) - p(10) = 300$. What does this mean? Give a complete sentence using units as appropriate.
- (d) Write an expression using the function $p(t)$ (and no other variables) that represents the displacement of the bike from $t = 20$ seconds to $t = 30$ seconds.
- (e) Write an expression using the function $v(t)$ (and no other variables) that represents the displacement of the bike from $t = 20$ seconds to $t = 30$ seconds.

- (4) Water flows into a pool. We have

$f(t)$ = The rate at which water flows into the pool (in gallons/minute) at time t (in minutes)

A table of values for $f(t)$ is given below:

t	0	2	4	6	8	10	12	14	16
$f(t)$	0.5	1	2	3.5	4.5	5	5.5	6.5	7

Write a Riemann sum with $n = 6$ subdivisions using left sample points estimating the amount of water that flowed into the pool from $t = 2$ minutes to $t = 14$ minutes. You do not need to evaluate or simplify your sum.

- (5) Suppose

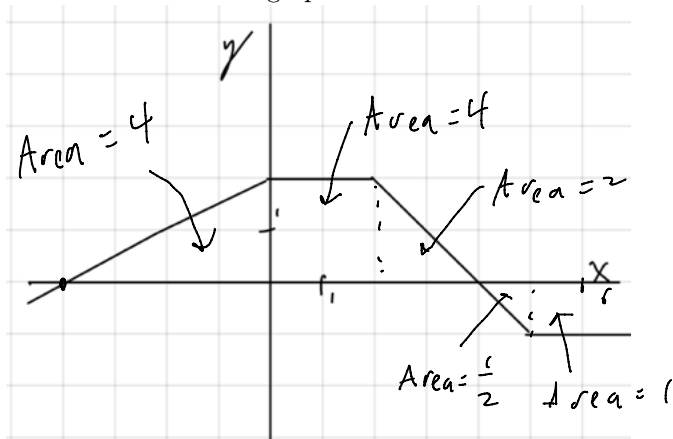
$f(t)$ = The rate the temperature is increasing (in $^{\circ}\text{F}/\text{hour}$) at time t

Where t here represents the number of hours after midnight. So for example, $f(8) = 1.2$ means that at 8:00 AM, the temperature is increasing at a rate of $1.2^{\circ}\text{F}/\text{hour}$. What does

$$\int_6^{10} f(t) dt$$

represent? Answer in english, giving units as appropriate.

- (1) Consider the function graphed below.



- (a) Evaluate $\int_{-4}^6 f(x) dx$

$$4 + 4 + 2 - \frac{1}{2} - 1 = 8 \frac{1}{2}$$

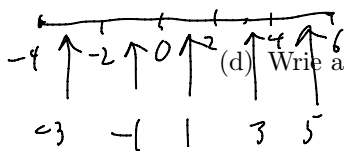
- (b) Evaluate $\int_6^{-4} f(x) dx$

$$-8 \frac{1}{2}$$

- (c) Write a left Riemann sum with $n = 5$ subdivisions for $\int_{-4}^6 f(x) dx$

$$\Delta x = \frac{10}{5} = 2$$

$$(0 + 1 + 2 + 2 + 0)2 = 10$$



- (d) Write a Riemann sum using midpoints with $n = 5$ subdivisions for $\int_{-4}^6 f(x) dx$

$$\left(\frac{1}{2} + 1\frac{1}{2} + 2 + 1 - 1\right)2 = 8$$

- (2) Consider the integral

$$\int_{-2}^2 \frac{1}{1+x^2} dx$$

- (a) Write out the Riemann sum with $n = 8$ subdivisions using left sample points for the above integral. You do not need to evaluate or simplify the sum. ~~Is this sum greater than or less than the integral?~~

$$\left(\frac{1}{1+(-2)^2} + \frac{1}{1+(-1.5)^2} + \frac{1}{1+(-1)^2} + \frac{1}{1+(-0.5)^2} + \frac{1}{1+0^2} + \frac{1}{1+(0.5)^2} + \frac{1}{1+1^2} + \frac{1}{1+(1.5)^2}\right) \cdot \frac{1}{2}$$

- (b) Write out the Riemann sum with $n = 8$ subdivisions using right sample points for the above integral. You do not need to evaluate or simplify the sum. ~~Is this sum greater than or less than the integral?~~

$$\left(\frac{1}{1+(-1.5)^2} + \frac{1}{1+(-1)^2} + \frac{1}{1+(-0.5)^2} + \frac{1}{1+0^2} + \frac{1}{1+0.5^2} + \frac{1}{1+1^2} + \frac{1}{1+1.5^2} + \frac{1}{1+2^2}\right) \cdot \frac{1}{2}$$

- (c) Write out the Riemann sum with $n = 8$ subdivisions using midpoint sample points for the above integral. You do not need to evaluate or simplify the sum.

$$\left(\frac{1}{1+(-1.75)^2} + \frac{1}{1+(-1.25)^2} + \frac{1}{1+(-0.75)^2} + \frac{1}{1+(-0.25)^2} + \frac{1}{1+0.25^2} + \frac{1}{1+0.75^2} + \frac{1}{1+1.25^2} + \frac{1}{1+1.75^2}\right) \cdot \frac{1}{2}$$

- (d) Write out the limit definition for the above integral. You may use left or right hand sums, whichever you like.

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \left(1 + \frac{1}{1+(-2+\frac{4k}{n})^2}\right) \frac{K}{n}$$

- (3) A bicycle travels along a straight road. Let

$p(t)$ = The position of the bicycle (in feet) at time t (in seconds)

$v(t)$ = The velocity of the bicycle (in feet/sec) at time t (in seconds)

- (a) Suppose $\int_{30}^{60} v(t) dt = 400$. What does this mean? Give a complete sentence using units as appropriate.

The displacement of the bicycle from 30 seconds to 60 seconds is 400ft

- (b) Suppose $p(20) = 200$. What does this mean? Give a complete sentence using units as appropriate.

The position of the bicycle at 20 seconds is 200ft.

- (c) Suppose $p(40) - p(10) = 300$. What does this mean? Give a complete sentence using units as appropriate.

The displacement of the bicycle from 10 seconds to 40 seconds is 300ft.

- (d) Write an expression using the function $p(t)$ (and no other variables) that represents the displacement of the bike from $t = 20$ seconds to $t = 30$ seconds.

$$p(30) - p(20)$$

- (e) Write an expression using the function $v(t)$ (and no other variables) that represents the displacement of the bike from $t = 20$ seconds to $t = 30$ seconds.

$$\int_{20}^{30} v(t) dt$$

- (4) Water flows into a pool. We have

$f(t)$ = The rate at which water flows into the pool (in gallons/minute) at time t (in minutes)

A table of values for $f(t)$ is given below:

t	0	2	4	6	8	10	12	14	16
$f(t)$	0.5	1	2	3.5	4.5	5	5.5	6.5	7

Write a Riemann sum with $n = 6$ subdivisions using left sample points estimating the amount of water that flowed into the pool from $t = 2$ minutes to $t = 14$ minutes. You do not need to evaluate or simplify your sum.

$$\Delta t = \frac{14-2}{6} = 2$$

$$(1 + 2 + 3.5 + 4.5 + 5 + 5.5) \cdot 2$$

- (5) Suppose

$f(t)$ = The rate the temperature is increasing (in $^{\circ}\text{F}/\text{hour}$) at time t

Where t here represents the number of hours after midnight. So for example, $f(8) = 1.2$ means that at 8:00 AM, the temperature is increasing at a rate of $1.2^{\circ}\text{F}/\text{hour}$. What does

$$\int_6^{10} f(t) dt$$

represent? Answer in english, giving units as appropriate.

The net amount the temperature increased in $^{\circ}\text{F}$ from 6:00 AM to 10:00 AM