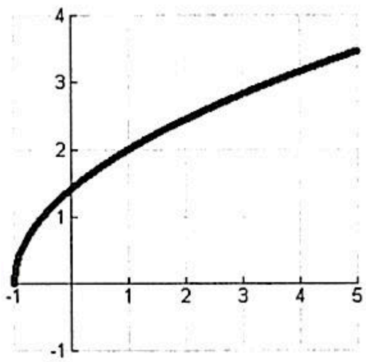
AP Calculus   Name ______________________________

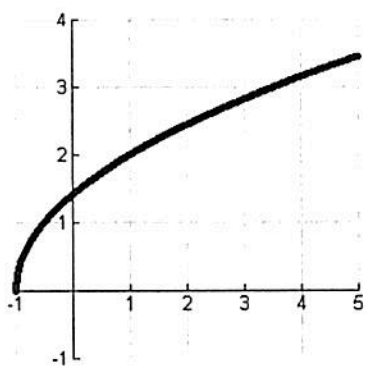
5.2 Area

Approximating the area of a region in the plane

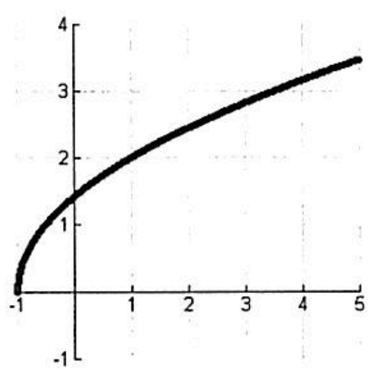
Left Riemann Sum



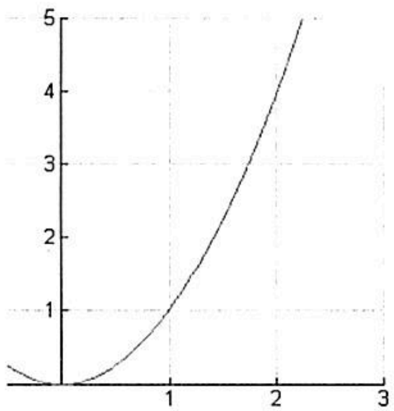
Right Riemann Sum



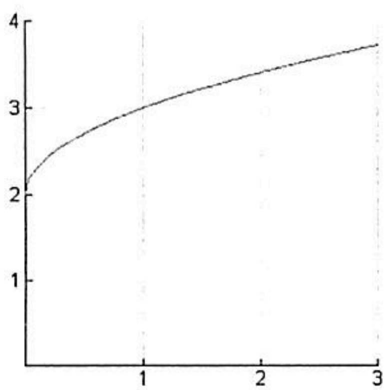
Midpoint Riemann Sum



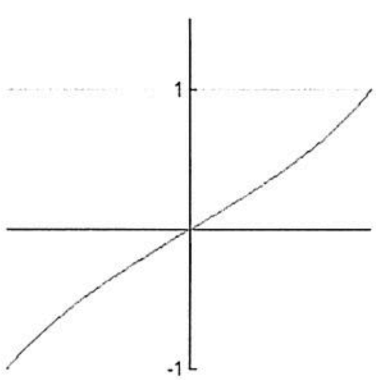
1) Approximate the left Riemann sum for the area of the region bounded by the graph of $f(x) = x^2$, the x-axis, and the vertical lines x = 0 and x = 2, using 4 rectangles.



2) Approximate the right Riemann sum for the area of the region bounded by the graph of $f(x) = \sqrt{x} + 2$, the x-axis, and the vertical lines x = 0 and x = 2, using 8 rectangles.



3) Approximate the midpoint Riemann sum for the area of the region bounded by the graph of f(x) = tan x, the x-axis, and the vertical lines x = 0 and x = $\frac{\pi}{4}$, using 4 rectangles.



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5.3 Riemann Sums and Definite Integrals

Riemann Sum

If f is continuous and non-negative on the interval [a, b], then the area of the region bounded by the graph of f, the x-axis, and the vertical lines x = a and x = b is

$$\text{Area} = \int_a^b f(x)dx \qquad \text{(definite integral)}$$

1) Approximate the value of $\int_0^{12} f(x)dx$ with 5 subintervals as indicated in the chart. Assume the function is an increasing function.

x	0	3	5	8	10	12
f(x)	0	4	7	10	14	17

a) Left Riemann sum:

b) Right Riemann sum:

c) Trapezoid sum:

Two ways to evaluate a definite integral, at this time –
1) rectangle/trapezoid methods
2) use a geometric formula

Sketch the region corresponding to each definite integral. Then evaluate each integral using a geometric formula.

2) $\int_{1}^{3} 4dx$

3) $\int_{0}^{3} (x+2)dx$

4) $\int_{-2}^{2} (\sqrt{4-x^2})dx$

5) $\int_{0}^{2} |x-1|dx$

6) Evaluate $\int_{1}^{3} (-x^2+4x-3)dx$ using each of the following values.

$\int_{1}^{3} x^2 dx = \frac{26}{3}$ $\quad\quad$ $\int_{1}^{3} xdx = 4$ $\quad\quad$ $\int_{1}^{3} dx = 2$

7) Given $\int_0^3 f(x)dx = 4$ and $\int_3^6 f(x)dx = -1$ evaluate:

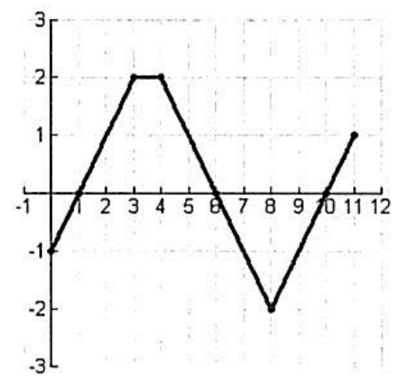
a) $\int_0^6 f(x)dx$

b) $\int_6^3 f(x)dx$

c) $\int_3^3 f(x)dx$

d) $\int_3^6 [-5f(x)+4]dx$

8) The graph of f consists of line segments, as shown in the figure. Evaluate each definite integral by using geometric formulas.



a) $\int_0^1 -f(x)dx$

b) $\int_3^4 3f(x)dx$

c) $\int_0^7 f(x)dx$

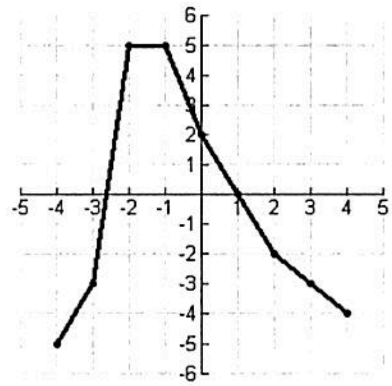
d) $\int_5^{11} [f(x)+2]dx$

e) $\int_0^{11} f(x)dx$

f) $\int_4^{10} [f(x)+3]dx$

9) Given the graph of f(x), find each A(t).

$A(t) = \int_0^t f(x)dx$



a) A(1)

b) A(-1)

c) A(3)

d) A(-2)

e) A(0)

Homework Page 278 – 280 # 15, 19, 23, 27, 29, 31, 35, 39, 41, 43, 46, 47
(12 Problems)

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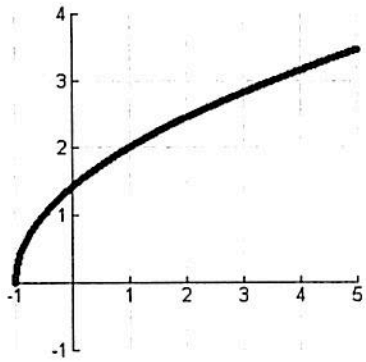
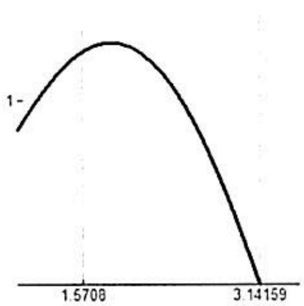
5.6 Trapezoid Rule



Area of a Trapezoid = $\frac{h}{2}(b_1 + b_2)$

1) Use the Trapezoidal Rule to approximate the area of the region bounded by the graph of $f(x) = \sqrt{x}\sin x$, the x-axis, and the vertical lines $x = \frac{\pi}{2}$ and $x = \pi$, using 4 equal subdivisions.



2) Approximate the area of the region bounded by f(x) using 3 subintervals. Assume the function is an increasing function.

x	0	3	6	9	12	15	18
f(x)	2	5	9	11	15	20	23

a) Left Riemann sum

b) Right Riemann sum

c) Midpoint Riemann sum

d) Trapezoidal sum

3) Approximate the area of the region bounded by f(x) using 5 subintervals as indicated in the chart. Assume the function is an increasing function.

x	1	4	6	9	11	15
f(x)	2	5	9	11	15	20

a) Left Riemann sum

b) Right Riemann sum

c) Trapezoidal sum