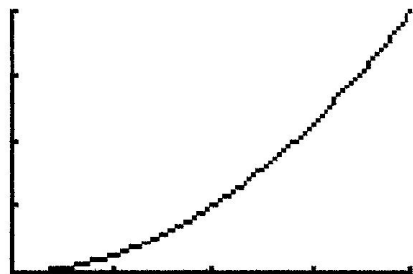


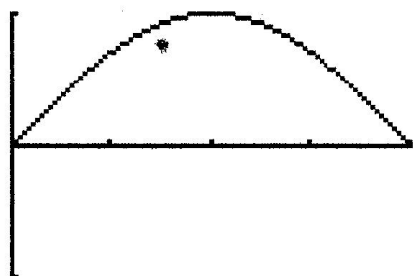
Estimate each of the following areas using the indicated method with the indicated number of rectangles. Is the approximation an over or under estimation? Be sure to sketch the rectangles in the pictures.

1) $f(x) = x^2$, RRAM, $n = 4$



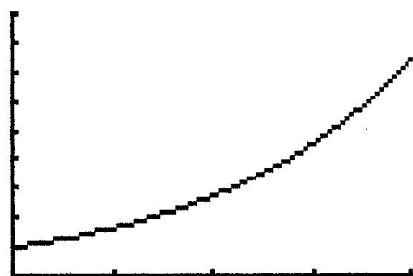
$[0, 2]$ by $[0, 4]$

2) $f(x) = \sin x$, MRAM, $n = 4$



$[0, \pi]$ by $[-1, 1]$

3) $f(x) = e^x$, LRAM, $n = 4$



$[0, 2]$ by $[0, 9]$

4) $y = \sqrt{x+3}$ Interval $[-1, 7]$ Use left sided Reimann sums. $\Delta x = 2$

5) $y = x^3 - 2x$ Interval $[2, 5]$ Use right sided Reimann sums. $\Delta x = 0.5$

6) $y = x^2 + x$ Interval $[0, 4]$ Use midpoint Reimann sums. $\Delta x = 1$

7)

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

t	0	20	40	60	80	100	120
$f(t)$	1.2	2.8	4.0	4.7	5.1	5.2	4.8

(a) Estimate $\int_0^{120} f(t)$ by using a left Riemann sum with six subintervals.

(b) Estimate $\int_0^{120} f(t)$ by using a right Riemann sum with six subintervals.

(c) Estimate $\int_0^{120} f(t)$ by using a midpoint sum with three subintervals.

(d) Estimate $\int_0^{120} f(t)$ by using the trapezoidal rule with three subintervals.