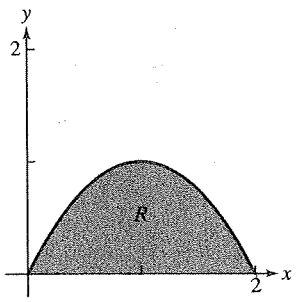
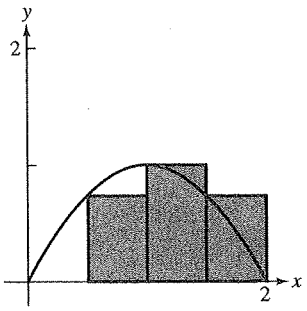
5. (a)



(b)

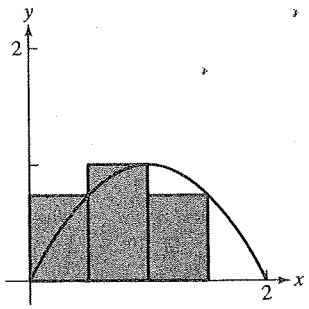


$$\Delta x = \frac{1}{2}$$

$$\text{LRAM: } [2(0)-(0)^2]\left(\frac{1}{2}\right)+\left[2\left(\frac{1}{2}\right)-\left(\frac{1}{2}\right)^2\right]\left(\frac{1}{2}\right)$$

$$+[2(1)-(1)^2]\left(\frac{1}{2}\right)+\left[2\left(\frac{3}{2}\right)-\left(\frac{3}{2}\right)^2\right]\left(\frac{1}{2}\right)=\frac{5}{4}=1.25$$

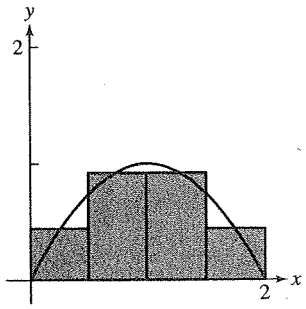
6. (a)



$$\text{RRAM: }\left[2\left(\frac{1}{2}\right)-\left(\frac{1}{2}\right)^2\right]\left(\frac{1}{2}\right)+[2(1)-(1)^2]\left(\frac{1}{2}\right)$$

$$+\left[2\left(\frac{3}{2}\right)-\left(\frac{3}{2}\right)^2\right]\left(\frac{1}{2}\right)+[2(2)-(2)^2]\left(\frac{1}{2}\right)=\frac{5}{4}=1.25$$

(b)



$$\text{MRAM: }\left[2\left(\frac{1}{4}\right)-\left(\frac{1}{4}\right)^2\right]\left(\frac{1}{2}\right)+\left[2\left(\frac{3}{4}\right)-\left(\frac{3}{4}\right)^2\right]\left(\frac{1}{2}\right)$$

$$+\left[2\left(\frac{5}{4}\right)-\left(\frac{5}{4}\right)^2\right]\left(\frac{1}{2}\right)+\left[2\left(\frac{7}{4}\right)-\left(\frac{7}{4}\right)^2\right]\left(\frac{1}{2}\right)=\frac{11}{8}=1.375$$

9.

n	LRAM_n	MRAM_n	RRAM_n
10	12.645	13.4775	14.445
50	13.3218	13.4991	13.6818
100	13.41045	13.499775	13.59045
500	13.482018	13.499991	13.518018

Estimate the area to be 13.5.

10.

n	LRAM_n	MRAM_n	RRAM_n
10	1.16823	1.09714	1.03490
50	1.11206	1.09855	1.08540
100	1.10531	1.09860	1.09198
500	1.09995	1.09861	1.09728
1000	1.09928	1.09861	1.09795

Estimate the area to be 1.0986.

Section 5.1

Day 2

11.

n	LRAM_n	MRAM_n	RRAM_n
10	0.98001	0.88220	0.78367
50	0.90171	0.88209	0.86244
100	0.89190	0.88208	0.87226
500	0.88404	0.88208	0.88012
1000	0.88306	0.88208	0.88110

Estimate the area to be 0.8821.

12.

n	LRAM_n	MRAM_n	RRAM_n
10	1.98352	2.00825	1.98352
50	1.99934	2.00033	1.99934
100	1.99984	2.00008	1.99984
500	1.99999	2.00000	1.99999

Estimate the area to be 2.

15. LRAM:

Area

$\approx f(2)\cdot 2+f(4)\cdot 2+f(6)\cdot 2+\cdots+f(22)\cdot 2$

$=2\cdot(0+0.6+1.4+\cdots+0.5)$

$=44.8\ (\text{mg/L})\cdot\text{sec}$

RRAM:

Area

$\approx f(4)\cdot 2+f(6)\cdot 2+f(8)\cdot 2+\cdots+f(24)\cdot 2$

$=2(0.6+1.4+2.7+\cdots+0)$

$=44.8\ (\text{mg/L})\cdot\text{sec}$

Patient's cardiac output:

$$\frac{5\text{ mg}}{44.8\ (\text{mg/L})\cdot\text{sec}}\cdot\frac{60\text{ sec}}{1\text{ min}}\approx 6.7\ \text{L/min}$$

Note that estimates for the area may vary.

16. (a) LRAM: $1\cdot(0+12+22+10+5+13+11+6+2+6)=87$ in. $=7.25$ ft

(b) RRAM: $1\cdot(12+22+10+5+13+11+6+2+6+0)=87$ in. $=7.25$ ft

19. (a) LRAM: $0.001(0+40+62+\cdots+137)=0.898$ mi

RRAM: $0.001(40+62+82+\cdots+142)=1.04$ mi

Average $=0.969$ mi

(b) The halfway point is 0.4845 mi. The average of LRAM and RRAM is 0.4460 at 0.006 h and 0.5665 at 0.007 h. Estimate that it took 0.006 h = 21.6 sec. The car was going 116 mph.

Day 3

24. Use LRAM with πx on the interval $[0,5]$, $n=5$.

$1(0+\pi+2\pi+3\pi+4\pi)=10\pi\approx 31.41593$

25. Use MRAM with πx on the interval $[0, 5]$. $n=5$.

$$1\left(\frac{1}{2}\pi+\frac{3}{2}\pi+\frac{5}{2}\pi+\frac{7}{2}\pi+\frac{9}{2}\pi\right)=\frac{25}{2}\pi\approx 39.26991$$

31. True. Because the graph rises from left to right, the left-hand rectangles will all lie under the curve.

32. False. For example, all three approximations are the same if the function is constant.

33. E. $y=4x-x^2=0$

$4x=x^2$

$x=0,4$

Use MRAM on the interval $[0, 4]$, $n=4$.

$1(1.75+3.75+3.75+1.75)=11$

34. D.

35. C.

$$\frac{\pi}{4}\left(\sin(0)+\sin\left(\frac{\pi}{4}\right)+\sin\left(\frac{\pi}{2}\right)+\sin\left(\frac{3\pi}{4}\right)\right)$$

$$\frac{\pi}{4}\left(0+\frac{\sqrt{2}}{2}+1+\frac{\sqrt{2}}{2}\right)$$

36. D.