

Section 6.1: 15-29 odd

15. Cannot use MRAM bc we don't have midpoint values (i.e.: $t=3,5,$ etc.).
 LRAM or RRAM are equally valid methods of estimation.

$A=bh$, $b=2$ for all rectangles, h = concentration

LRAM = $2(0+0.6+1.4+2.7+3.7+4.1+3.8+2.9+1.7+1.0+0.5) = \boxed{44.8 \text{ mg/L}\cdot\text{s}}$

Cardiac output = $\frac{\text{mg of dye}}{\text{area under curve}} = \frac{5 \text{ mg}}{44.8 \frac{\text{mg}\cdot\text{s}}{\text{L}}} = 0.112 \text{ L/s}$

$\frac{0.112 \text{ L}}{1 \cancel{\text{s}}} \cdot \frac{60 \cancel{\text{s}}}{1 \text{ min}} = \boxed{6.696 \text{ L/min}}$

17. $D = r \cdot t = v \cdot t$

time interval = 5 min = 300 sec (so all units are in seconds)

LRAM = $300(1+1.2+1.7+2.0+1.8+1.6+1.4+1.2+1.0+1.8+1.5+1.2) = \boxed{5,220 \text{ m}}$

RRAM = $300(1.2+1.7+2.0+1.8+1.6+1.4+1.2+1.0+1.8+1.5+1.2+0) = \boxed{4,920 \text{ m}}$

19. LRAM = $0.001(6+40+62+82+96+108+116+125+132+137) = 0.898 \text{ mi}$

RRAM = $0.001(40+62+82+96+108+116+125+132+137+142) = 1.040 \text{ mi}$

Average of estimates = $\frac{0.898+1.040}{2} = \boxed{0.969 \text{ mi}}$

Halfway point = $\frac{1}{2}(0.969) = 0.4845 \text{ mi}$

Time	Velocity	New Area	Total Area (Distance Traveled)
0	0	0	0
0.001	40	0.04	0.04
0.002	62	0.062	0.102
0.003	82	0.082	0.184
0.004	96	0.096	0.280
0.005	108	0.108	0.388
0.006	116	0.116	0.504 ← closest to 0.4845 mi

$t = 0.006 \text{ hr} = \boxed{21.6 \text{ s}, 116 \text{ mph}}$ at that time (from data table)

21. Right endpoints: 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4

$r = y = \sqrt{16-x^2}$, h = thickness of cylinder = 0.5

$V = \pi r^2 h = \pi \sqrt{16-x^2}^2 \cdot 0.5 = 0.5\pi(16-x^2)$

RRAM = $0.5\pi(16-0.5^2+16-1^2+16-1.5^2+16-2^2+16-2.5^2+16-3^2+16-3.5^2+16-4^2)$

RRAM = $\boxed{120.951, \text{ underestimate}}$

$\frac{134.041 - 120.951}{134.041} \times 100\% \approx \boxed{10\% \text{ error}}$

23. $V = 30 \cdot \text{Area}$

$LRAM = 30 \cdot 5(6.0 + 8.2 + 9.1 + 9.9 + 10.5 + 11.0 + 11.5 + 11.9 + 12.3 + 12.7) = \boxed{15,465 \text{ ft}^3}$

$RRAM = 30 \cdot 5(8.2 + 9.1 + 9.9 + 10.5 + 11.0 + 11.5 + 11.9 + 12.3 + 12.7 + 13.0) = \boxed{16,515 \text{ ft}^3}$

25. Midpoints: 0.5, 1.5, 2.5, 3.5, 4.5

Cylinder: $\pi r^2 h$

$r = y = \sqrt{x} \rightarrow r^2 = \sqrt{x}^2 = x$, $h = \text{thickness of cylinder} = 1$

$MRAM = \pi \cdot 1(0.5 + 1.5 + 2.5 + 3.5 + 4.5) = \boxed{39.270}$

27. Initial velocity = 400 ft/s, gravity = 32 ft/s²

a) Gravity is the only thing taking away from velocity (no air resistance, etc.)

Velocity = Initial Velocity - Gravity \times Time

$v = 400 - 32(5) = 400 - 160 = \boxed{240 \text{ ft/s}}$

b) $v = 400 - 32t$

t	0	1	2	3	4	5	RRAM = 1(368 + 336 + 304 + 272 + 240)
v	400	368	336	304	272	240	

29. Upper estimate = RRAM, lower estimate = LRAM

RRAM = end of each month

$RRAM = 30(0.20 + 0.25 + 0.27 + 0.34 + 0.45 + 0.52) = \boxed{60.9 \text{ tons}}$

LRAM = beginning of each month, initial value = 0.05

$LRAM = 30(0.05 + 0.20 + 0.25 + 0.27 + 0.34 + 0.45) = \boxed{46.8 \text{ tons}}$

b) Best case = LRAM

Month	Amount	Subtotal (Tons)
Jan	$30(0.05) = 1.5$	1.5 tons
Feb	$30(0.20) = 6$	7.5 tons
Mar	$30(0.25) = 7.5$	15 tons
Apr	$30(0.27) = 8.1$	23.1 tons
May	$30(0.34) = 10.2$	33.3 tons
Jun	$30(0.45) = 13.5$	46.8 tons
Jul	$30(0.52) = 15.6$	66.4 tons
Aug	$30(0.63) = 18.9$	81.3 tons
Sep	$30(0.70) = 21$	102.3 tons
Oct	$30(0.81) = 24.3$	126.6 tons \leftarrow closest to 125 tons before $\boxed{\text{end of October}}$