Review of Integration

1. a) the distance (in feet) the rocket travels from $t = 10$ sec to $t = 70$ sec

b) width $= \dfrac{70-10}{3} = 20$

$20(22 + 35 + 44) = 20(101) = \boxed{2020 \text{ ft}}$

2. a) $(6, 62)\ (8, 55)$

$T'(7) = \dfrac{55-62}{8-6} = \boxed{-\dfrac{7}{2}\ {}^\circ C/cm}$

b) $\dfrac{1}{8-0}\displaystyle\int_0^8 T(x)\,dx = \dfrac{1}{8}\int_0^8 T(x)\,dx = \dfrac{1}{8}(605.5)$

$= \boxed{75.6875^\circ C}$

trap. $\left.\begin{array}{l} \frac{1}{2}(1)(100+93) \\ \frac{1}{2}(4)(93+70) \\ \frac{1}{2}(1)(70+62) \\ \frac{1}{2}(2)(62+55) \end{array}\right\} = 605.5$

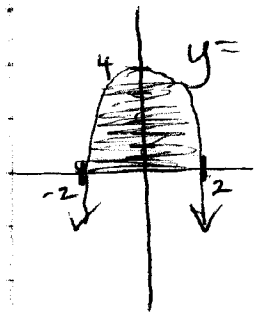
3. $h = \dfrac{1-.1}{9} = .1$

$\frac{1}{2}(.1)(22 + 2\cdot 28 + 2\cdot 32 + 2\cdot 34 + 2\cdot 34 + 2\cdot 32 + 2\cdot 28$
$+ 2\cdot 22 + 2\cdot 14 + 4) = \frac{1}{2}(.1)(474)$
$= \boxed{23.7}$

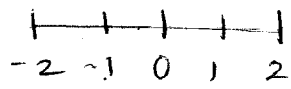
4. interval is 10 min $\Rightarrow \frac{10}{60} = \frac{1}{6}$ hr. (vel. given in mph)

height $= \dfrac{\frac{1}{6}}{10} = \dfrac{1}{60}$

$\frac{1}{2}\left(\frac{1}{60}\right)(0 + 2\cdot 50 + 2\cdot 60 + 2\cdot 80 + 2\cdot 90 + 2\cdot 100 + 2\cdot 95$
$+ 2\cdot 85 + 2\cdot 80 + 2\cdot 75 + 85) = \frac{1}{120}(1515) = \boxed{12.625 \text{ mi}}$

5. 

rect. width $= \dfrac{2-(-2)}{4} = 1$



x	$f(x)$	x	$f(x)$
-2	0	-1.5	1.75
-1	3	$-.5$	3.75
0	4	$.5$	3.75
1	3	1.5	1.75
2	0		

a) $1\,(0+3+4+3) = 10$

b) $1\,(3+4+3+0) = 10$

c) $1\,(1.75+3.75+3.75+1.75) = 11$

d) $\frac{1}{2}(1)(0+2\cdot 3+2\cdot 4+2\cdot 3+0) = 10$

e) see work for parts a & b & d $\Rightarrow$ all 10

6. a) $1\,(0+6+10+16+14+12+18+22+12+4) = \boxed{114\text{ in}}$

b) $1\,(6+10+16+14+12+18+22+12+4+2) = \boxed{116\text{ in}}$

7. $1.2(4.3) + 1.1(3.1) + 1.5(2.2) + 1.6(1.5)$
$= \boxed{14.27 \text{ liters}}$

8. left sum:
$5(24+76+106+124+135) = 2325$

avg. temp $= \dfrac{1}{25-0}\displaystyle\int_0^{25} T(x)\,dx = \frac{1}{25}(2325) = \boxed{93^\circ C}$

9. $\frac{1}{2}(1)(0+2\cdot 6+2\cdot 10+2\cdot 16+2\cdot 14+2\cdot 12+2\cdot 18$
$+2\cdot 22+2\cdot 12+2\cdot 4+2) = \boxed{115\text{ in}}$

10.

x	$f(x) = x^2$
-2	4
-1	1
0	0
1	1
2	4

$ht = \dfrac{2-(-2)}{4} = 1$

$\frac{1}{2}(1)(4+2\cdot 1+2\cdot 0+2\cdot 1+4) = \boxed{6}$

11. $\frac{1}{2}(3)(10+20) + \frac{1}{2}(2)(20+40) + \frac{1}{2}(1)(40+30)$
$= \boxed{140}$

12. a) $R'(45) = \frac{55-40}{50-40} = \frac{15}{10} = 1.5$ gal/min/min
(40, 40) (50, 55)
or $\boxed{1.5 \text{ gal/min}^2}$

b) $\int_0^{90} R(t)\,dt = 30(20) + 10(30) + 10(40)$
$+ 20(55) + 20(65) = 3700$ gal

The approximation is <u>less than</u> the actual value because the function $R(t)$ is increasing on $[0, 90]$ and LRAM gives an underapproximation.