Ch. 6 Review: 1-33 odd, skip 7

1. $y = 4x - x^3$

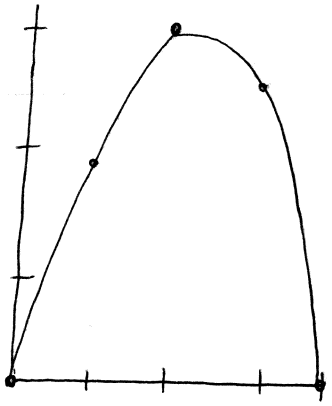
$y(0) = 4\cdot 0 - 0^3 = 0 - 0 = 0$

$y(\frac{1}{2}) = 4(\frac{1}{2}) - (\frac{1}{2})^3 = 2 - \frac{1}{8} = \frac{15}{8} = 1\frac{7}{8}$

$y(1) = 4\cdot 1 - 1^3 = 4 - 1 = 3$

$y(\frac{3}{2}) = 4\cdot\frac{3}{2} - (\frac{3}{2})^3 = 6 - \frac{27}{8} = \frac{21}{8} = 2\frac{5}{8}$

$y(2) = 4\cdot 2 - 2^3 = 8 - 8 = 0$



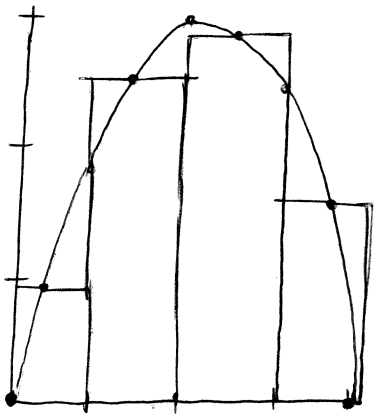
Careful: cubic functions are not necessarily symmetric like parabolas

3. $y(\frac{1}{4}) = 4(\frac{1}{4}) - (\frac{1}{4})^3 = 1 - \frac{1}{64} = \frac{63}{64}$

$y(\frac{3}{4}) = 4(\frac{3}{4}) - (\frac{3}{4})^3 = 3 - \frac{27}{64} = \frac{165}{64} = 2\frac{37}{64}$

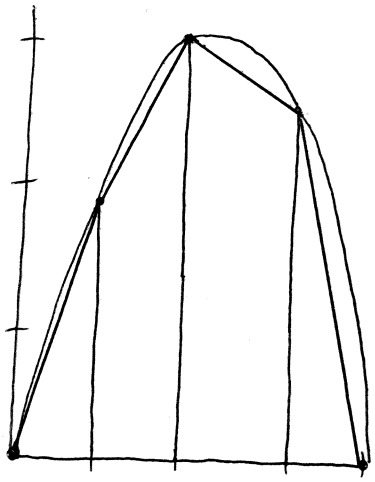
$y(\frac{5}{4}) = 4(\frac{5}{4}) - (\frac{5}{4})^3 = 5 - \frac{125}{64} = \frac{195}{64} = 3\frac{3}{64}$

$y(\frac{7}{4}) = 4(\frac{7}{4}) - (\frac{7}{4})^3 = 7 - \frac{343}{64} = \frac{105}{64} = 1\frac{41}{64}$



$MRAM = 0.5\left(\frac{63}{64} + \frac{165}{64} + \frac{195}{64} + \frac{105}{64}\right) = \boxed{4.125}$

5.



Trapezoid $= \frac{1}{2}h(b_1 + b_2)$

$T = \frac{1}{2}\cdot\frac{1}{2}\left(0 + 2\cdot\frac{15}{8} + 2\cdot 3 + 2\cdot\frac{21}{8} + 0\right) = \boxed{3.75}$

7. a) Opposite of $\int_2^5 f(x)\,dx$, so **true**

b) $4 + 3 + 2 = 9$, so **true**

c) $\int_{-2}^{5} f(x)\,dx = 4 + 3 = 7$ vs $\int_{-2}^{5} g(x)\,dx = 2$, so $g(x) \le f(x)$ on $[-2, 5]$

false

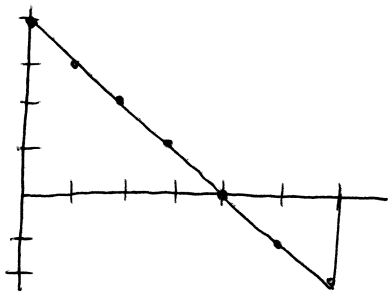
11. $D = r \cdot t = v \cdot t$, so find area under curve (have to estimate)

t	0	1	2	3	4	5	6	7	8	9	10
v	0	0.5	1.1	2	3.4	4.5	4.8	4.5	3.5	2	0

$T = \frac{1}{2} \cdot 1 \cdot (0 + 2(0.5) + 2(1.1) + 2(2) + 2(3.4) + 2(4.5) + 2(4.8) + 2(4.5) + 2(3.5) + 2(2) + 0)$

$T = 26.3$, so $26.3 \frac{m}{s} \cdot s =$ **26.3 m**

13. $y = 4 - x$, $0 \le x \le 6$



$\frac{1}{2} \cdot 4 \cdot 4 + \frac{1}{2} \cdot 2 \cdot 2 = 8 + 2 =$ **10**

15. $\int_{-2}^{2} 5\,dx = 5x \Big|_{-2}^{2} = 5(2) - 5(-2) = 10 + 10 =$ **20**

17. $\int_{0}^{\pi/4} \cos x\,dx = \sin x \Big|_{0}^{\pi/4} = \sin\frac{\pi}{4} - \sin 0 = \frac{\sqrt{2}}{2} - 0 =$ **$\frac{\sqrt{2}}{2}$**

19. $\int_{0}^{1} (8s^3 - 12s^2 + 5)\,ds = 2s^4 - 4s^3 + 5s \Big|_{0}^{1} = 2 - 4 + 5 =$ **3**

21. $\int_{1}^{27} y^{-4/3}\,dy = -3y^{-1/3} \Big|_{1}^{27} = \frac{-3}{\sqrt[3]{y}} \Big|_{1}^{27} = \frac{-3}{\sqrt[3]{27}} + \frac{3}{\sqrt[3]{1}} = \frac{-3}{3} + \frac{3}{1} = -1 + 3 =$ **2**

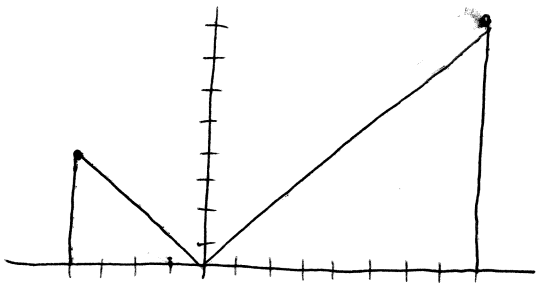
23. $\int_{0}^{\pi/3} \sec^2\theta\,d\theta = \tan\theta \Big|_{0}^{\pi/3} = \tan\pi/3 - \tan 0 = \frac{\sqrt{3}/2}{1/2} - \frac{0}{1} = \frac{\sqrt{3}}{2} \cdot \frac{2}{1} =$ **$\sqrt{3}$**

25. $\int_{0}^{1} \frac{36}{(2x+1)^3}\,dx = \int_{0}^{1} 36(2x+1)^{-3}\,dx = -9(2x+1)^{-2} \Big|_{0}^{1} = \frac{-9}{(2x+1)^2} \Big|_{0}^{1} = \frac{-9}{9} + \frac{9}{1} = -1 + 9 =$ **8**

27. $\int_{-\pi/3}^{0} \sec x \tan x \, dx = \sec x \Big|_{-\pi/3}^{0} = \sec 0 - \sec(-\pi/3) = \frac{1}{1} - \frac{2}{1} = 1 - 2 = \boxed{-1}$

29. $\int_{0}^{2} \frac{2}{y+1} dy = 2\ln(y+1) \Big|_{0}^{2} = 2\ln 3 - 2\ln 1 = 2\ln 3 - 2(0) = \boxed{2\ln 3}$

31. $\int_{-4}^{8} |x| dx$



$\frac{1}{2} \cdot 4 \cdot 4 + \frac{1}{2} \cdot 8 \cdot 8 = 8 + 32 = \boxed{40}$

33. 1 day = 24 hr, so $\text{hr} \cdot \frac{\text{L}}{\text{hr}} = \text{L}$

Data is increasing, so LRAM = lower and RRAM = upper

a) LRAM = $24(0.019 + 0.020 + 0.021 + 0.023 + 0.025 + 0.028 + 0.031) = \boxed{4.008 \text{ L}}$

RRAM = $24(0.020 + 0.021 + 0.023 + 0.025 + 0.028 + 0.031 + 0.035) = \boxed{4.392 \text{ L}}$

b) $T = \frac{1}{2} \cdot 24(0.019 + 2(0.020) + 2(0.021) + 2(0.023) + 2(0.025) + 2(0.028) + 2(0.031) + 0.035)$

$T = \boxed{4.2 \text{ L}}$