HW: page 425 3,5,7,11,15,19,23,27b
page 437 1a,3,5,7,13a,35,53

3) $\int_2^3 x^3\,dx = \frac{x^4}{4}\Big|_2^3 = \frac{81}{4} - \frac{16}{4} = \frac{65}{4}$

5) $\int_1^9 \sqrt{x}\,dx = \frac{2}{3}x^{3/2}\Big|_1^9 = \frac{2}{3}\left(9^{3/2} - 1\right) = \frac{2}{3}(27-1) = \frac{52}{3}$

7) $\int_1^3 e^x\,dx = e^x\Big|_1^3 = e^3 - e \doteq 17.37$

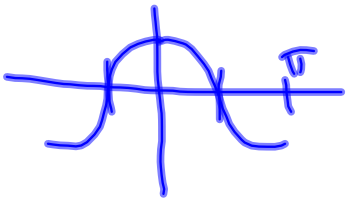
13) $\int_4^9 2x\sqrt{x}\,dx = \int_4^9 2x^{3/2}\,dx$

$= 2\cdot\frac{2x^{5/2}}{5}\Big|_4^9 = \frac{4}{5}\left(9^{5/2} - 4^{5/2}\right)$

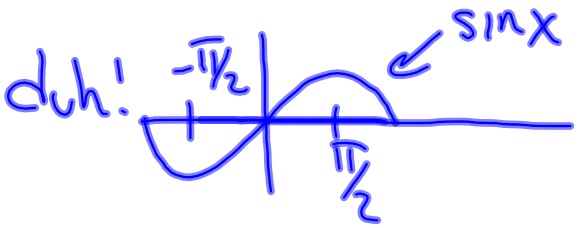
$= \frac{4}{5}(243 - 32) = \frac{844}{5}$

15) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin\theta \, d\theta = -\cos\theta \Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}} = -\left(\cos\frac{\pi}{2} - \cos\left(-\frac{\pi}{2}\right)\right)$

$= -\left(0 - 0\right) = 0$



duh!



19) $\int_{\ln 2}^{3} 5e^x dx = 5(e^x)\Big|_{\ln 2}^{3} = 5(e^3 - 2) = 5e^3 - 10$

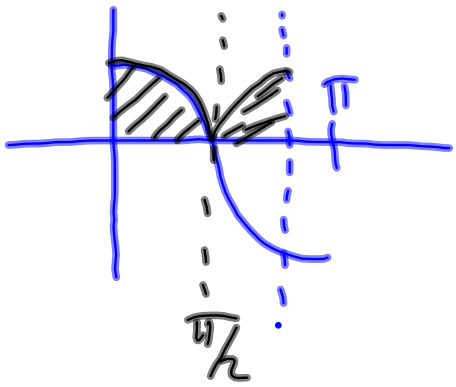
23) $\int_{\pi/6}^{\pi/2} \left(x + \frac{2}{\sin^2 x}\right) dx = \int_{\pi/6}^{\pi/2} (x + 2\csc^2 x)\, dx$

$= \frac{x^2}{2} - 2\cot x \Big|_{\pi/6}^{\pi/2} = \frac{(\pi/2)^2}{2} - 2\cot\left(\frac{\pi}{2}\right) - \left(\frac{(\pi/6)^2}{2} - 2\cot\frac{\pi}{6}\right)$

$= \frac{\pi^2}{8} - 2(0) - \left(\frac{\pi^2}{72} - 2\sqrt{3}\right) = \frac{8\pi^2}{72} + 2\sqrt{3}$

$= \frac{\pi^2}{9} + 2\sqrt{3}$

27b) $\int_0^{\frac{3\pi}{4}} |\cos x|\,dx$



$= \int_0^{\pi/2} \cos x\,dx - \int_{\pi/2}^{3\pi/4} \cos x\,dx$

$= \sin x\Big|_0^{\pi/2} - \sin x\Big|_{\pi/2}^{3\pi/4} = \sin\frac{\pi}{2} - \sin 0 - \left(\sin\frac{3\pi}{4} - \sin\frac{\pi}{2}\right)$

$= 1 - 0 - \left(\frac{1}{\sqrt{2}} - 1\right)$

$= 2 - \frac{1}{\sqrt{2}}$

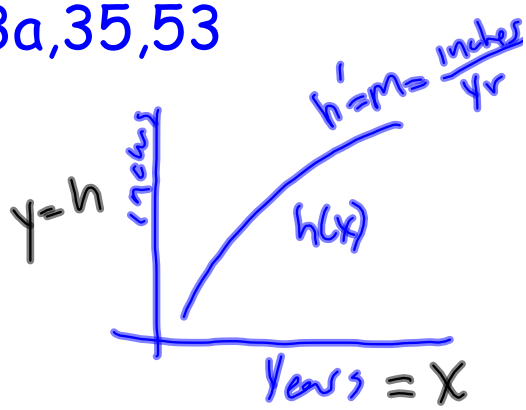
HW: page 437 1a,3,5,7,13a,35,53

1a) $h'(t) = \Delta \text{height}$

$$\int_0^{10} h'(t)\,dt$$

$= h(10) - h(0)$

= height at 10yrs − ~~height~~ 0 years → 0



3) a) disp = (signed) Area

$\int_0^3 v(t)\,dt = \frac{1}{2} - 1 = -\frac{1}{2}$

dist = whole Area (+)

$\frac{1}{2} + 1 = \frac{3}{2}$

b) $disp = \int_0^3 v(t)\,dt = \frac{1}{2} + 1 + \frac{1}{4} - \frac{1}{4} = \frac{3}{2}$

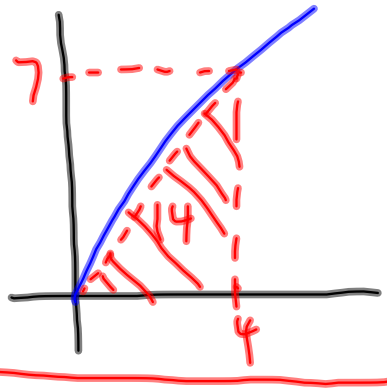
dist = $\frac{1}{2} + 1 + \frac{1}{4} + \frac{1}{4} = 2$

5) $a_{avg} = \frac{1}{4-0}\int_0^4 a(t)\,dt = \frac{1}{4}(15) = \frac{15}{4}\ m/s^2$

$v(4) = v_0 + \bar{a}t$

$= 20 + \left(\frac{15}{4}\right)4$

$= 35\ m/s$



$a_{avg} = \frac{1}{6-0}(27) = \frac{27}{6}$

$A = \frac{6 \cdot 9}{2} = 27$

$v(6) = v_0 + \bar{a}t$

$= 20 + 27 = 47.$

7a) $v(t) = t^3 - 2t^2 + 1 \qquad s(0) = 1$

$\int v(t)\,dt = s(t)$

$\frac{t^4}{4} - \frac{2t^3}{3} + t + C = s(t)$

$0 + 0 + 0 + C = 1$

$\frac{t^4}{4} - \frac{2}{3}t^3 + t + 1 = s(t)$

7b) $a(t) = 4\cos 2t$

$v(t) = \int 4\cos 2t = \frac{4}{2}\int \cos 2t\,(2dt) = 2\sin 2t + C$

$v(0) = -1 \Rightarrow -1 = 2\sin(0) + C$

$-1 = C$

$v(t) = 2\sin 2t - 1$

$s(t) = \int (2\sin 2t - 1)\,dt = \frac{2}{2}\int \sin 2t\,(2dt) - \int dt$

$= -\cos 2t - t + C$

$s(0) = -3 \Rightarrow -3 = -\cos(0) - 0 + C$

$-3 = -1 + C$

$s(t) = -\cos 2t - t - 2$ $\quad -2 = C$

13a) $v(t) = t^3 - 3t^2 + 2t \qquad 0 \le t \le 3$

disp $\int_0^3 (t^3 - 3t^2 + 2t)\,dt = \frac{t^4}{4} - 3\frac{t^3}{3} + 2\frac{t^2}{2}\Big|_0^3$

$= \frac{81}{4} - 27 + 9 - 0 = \frac{9}{4}$

dist $t^3 - 3t^2 + 2t = 0$

$t(t^2 - 3t + 2) = 0$

$t(t-2)(t-1) = 0$

$t = 2 \quad t = 1$

$$\int_0^1 (t^3-3t^2+2t)\,dt = \frac{t^4}{4} - t^3 + t^2 \Big|_0^1 = \frac{1}{4} - 1 + 1 = \frac{1}{4}$$

$$\frac{t^4}{4} - t^3 + t^2 \Big|_1^2 = 4 - 8 + 4 - \left(\frac{1}{4}\right) = -\frac{1}{4}$$

$$\frac{t^4}{4} - t^3 + t^2 \Big|_2^3 = \frac{81}{4} - 27 + 9 - \left(4 - 8 + 4\right) = \frac{9}{4} - 0$$

$$\text{dist} = \frac{1}{4} + \frac{1}{4} + \frac{9}{4} = \frac{11}{4}$$

35) $V(0)=0$ $a=2.6\ m/s^2$

$S(t)=S_0+V_0t+\frac{1}{2}at^2$

$V(t)=V_0+at$

$S(t_1)=120\ m$

$S(t)=120=0+0(t)+\frac{1}{2}(2.6)t^2$

$120=1.3t^2$

$9.6=t$

$V(t)=0+2.6(9.6)=25\ m/s$

$V(0)=25$

$V(t)=12$

$a=-1.5$

$12=25+(-1.5)t$

$\frac{-13}{-1.5}=t=8.7s$

$S(8.7)=120+25(8.7)+(-1.5)(8.7)^2$

$=224\ m$

53) $f(x)=\frac{1}{x}$ $[1,e]$

$$\frac{1}{e-1}\int_1^e \frac{1}{x}dx = \frac{1}{e-1}\ln x\Big|_1^e = \frac{1}{e-1}(1-0) = \frac{1}{e-1}$$