Ch 8 Review

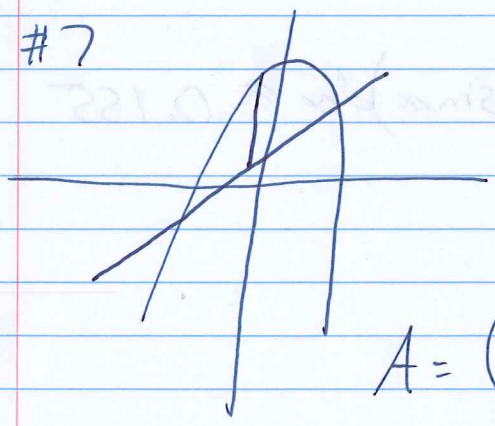
#1 $\int_0^5 |v(t)|\,dt \approx 10.417$ ft

#2 $\int_0^7 C(t)\,dt \approx 31.361$ gal

#4 $\int_0^2 p(x)\,dx = 14$ g ($p(x)$: g/m, dx: m, so g/m · m = g)

$$\int_0^2 (11-4x)\,dx = 11x - 2x^2\Big|_0^2 = 22-8=14$$

#7



$3-x^2 = x+1$

$x^2+x-2=0$

$(x+2)(x-1)=0$

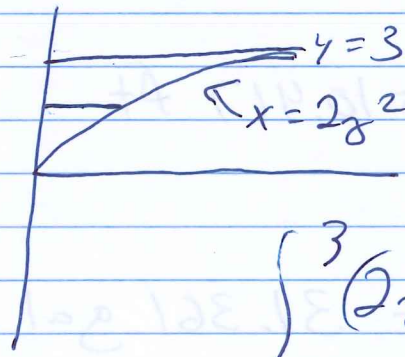
$x=-2, 1$

$$A=\int_{-2}^{1}\left[\sqrt{3-x^2}-(x+1)\right]dx \approx 4.5 \text{ or } 9/2$$

$$A=\int_{-2}^{1}(3-x^2-x-1)\,dx$$

$$=\int_{-2}^{1}(-x^2-x+2)\,dx \approx$$

#9

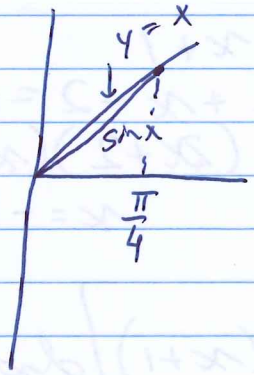


$$\int_0^3 (2y^2)\,dy$$

$$\frac{2y^3}{3}\Big|_0^3 = 18$$

#11 $y = \sin x$, $y = x$, $x = \pi/4$

★ Use your table feature to note that $y = x$ is the higher curve. Difficult to see on calc.

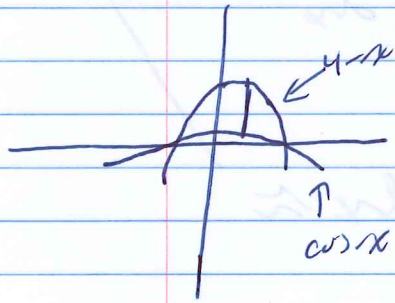


$$\int_0^{\frac{\pi}{4}} (x - \sin x)\,dx \approx 0.155$$

#13 $y = \cos x$, $y = 4 - x^2$

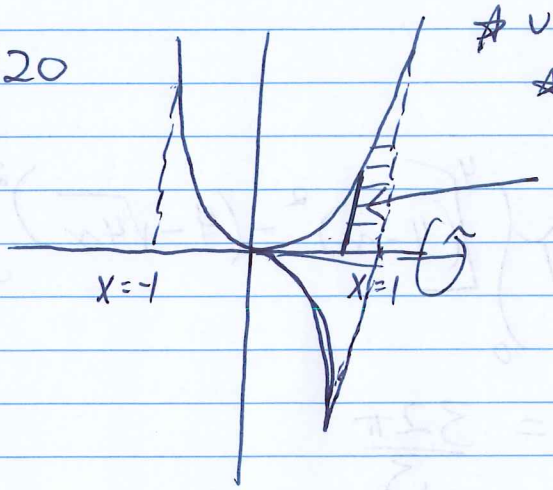
$4 - x^2 = \cos x$

$x \approx 2.1281265$



$$2\int_0^{2.1281265} (4 - x^2 - \cos x)\,dx \approx 8.902$$

#20



* use symmetry
* disk!

$r = 3x^4$

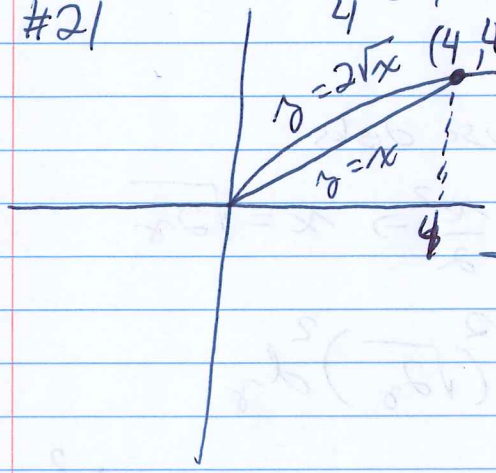
$$2\pi \int_0^1 (3x^4)^2 \, dx$$

$$\approx 6.283 = 2\pi$$

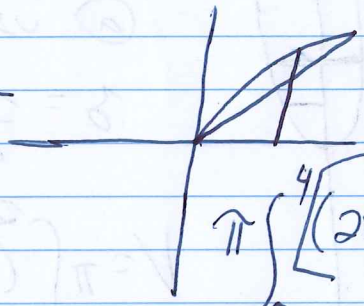
#21

$\frac{y^2}{4} = y$ * $y^2 - 4y = 0$

* $y(y-4)$



(a) washers

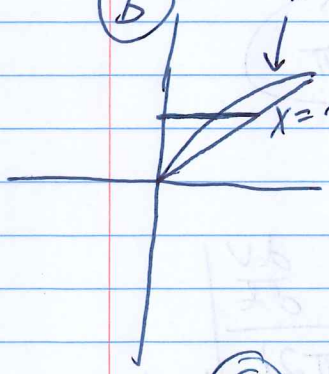


$$\pi \int_0^4 \left[(2\sqrt{x})^2 - x^2 \right] dx$$

$$= \frac{32\pi}{3}$$

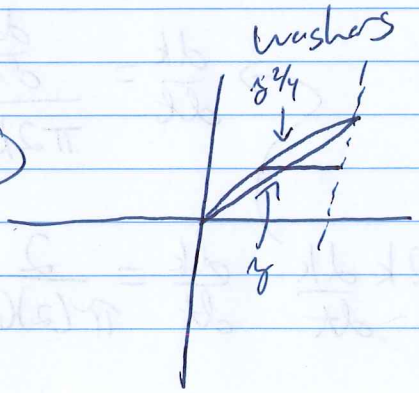
(b) washers

$x = \frac{y^2}{4}$



$$\pi \int_0^4 \left[y^2 - \left(\frac{y^2}{4} \right)^2 \right] dy = \frac{128\pi}{15}$$

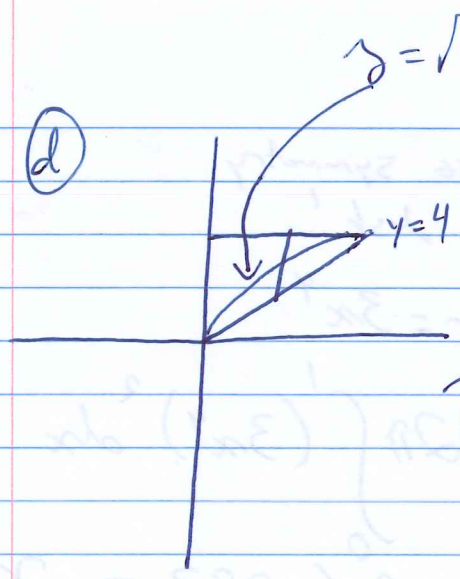
(c) washers



$$\pi \int_0^4 \left[(4 - y^2/4)^2 + (4 - y)^2 \right] dy$$

$$= \frac{64\pi}{5}$$

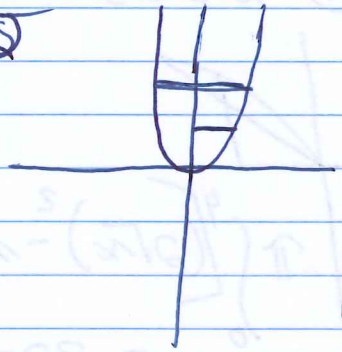
(d)



$$\pi\int_0^4 \left[(4-x)^2-(4-\sqrt{4x})^2\right]dx$$

$$=\frac{32\pi}{3}$$

#25



(a) use disks

$$y=\frac{x^2}{2} \Rightarrow x=\sqrt{2y}$$

$$V=\pi\int_0^2 (\sqrt{2y})^2\,dy$$

$$=\pi\int_0^2 2y\,dy=\pi y^2\Big|_0^2$$

$$=4\pi$$

(b) $V=\pi y^2$

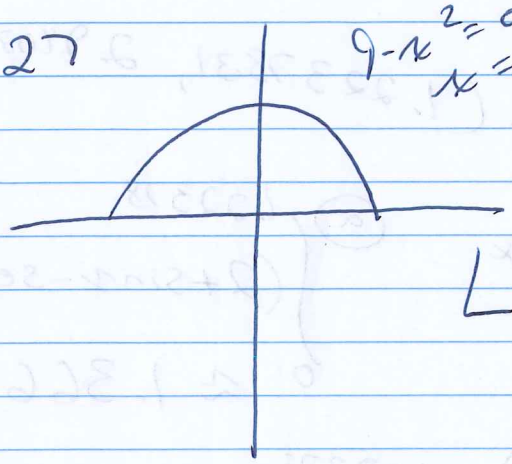
$$V(k)=\pi k^2$$

(c) $V(k)=\pi k^2$

$$\frac{dV}{dt}=\pi 2k\frac{dk}{dt} \quad \frac{dk}{dt}=\frac{2}{\pi(2)(1)}=\frac{1}{\pi}$$

$$\frac{dk}{dt}=\frac{\frac{dV}{dt}}{\pi 2k}\Big|_{k=1}$$

#27



$9 - x^2 = 0$

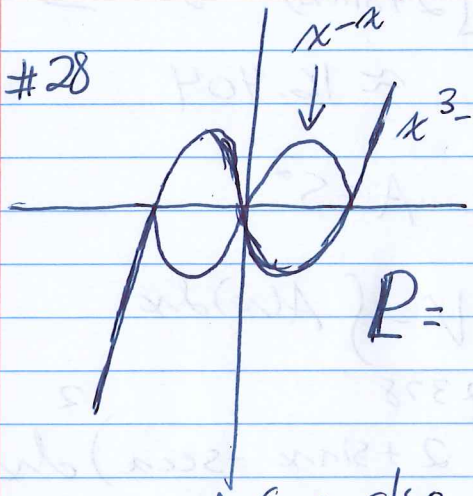
$x = \pm 3$

*Could also use symmetry

$$L = \int_{-3}^{3} \sqrt{1 + (-2x)^2}\, dx$$

$$\approx 19.494$$

#28



$x - x^3 = x^3 - x$

$2x^3 - 2x = 0$

$2x(x^2 - 1)$

$x = 0, \pm 1$

$$P = \int_{-1}^{1} \sqrt{1 + (1 - 3x^2)^2}\, dx + \int_{-1}^{1} \sqrt{1 + (3x^2 - 1)^2}\, dx$$

*Can also use symmetry

$$\approx 5.245$$

#34

$F = kx$

$80\,N = k(0.3)$

$k = \frac{800}{3}\ N/m$

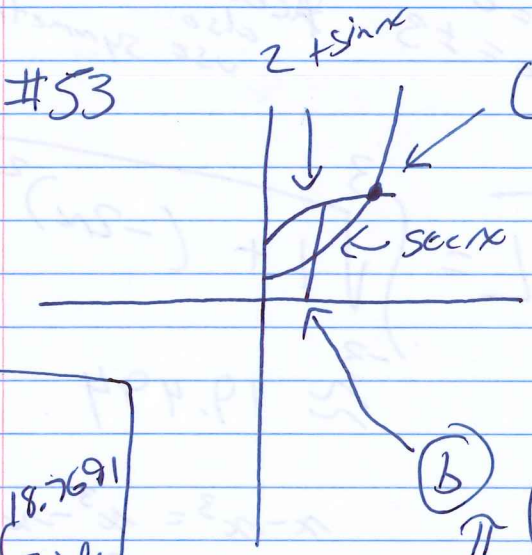
To stretch 0.3 m...

$$W = \int_0^{0.3} kx\, dx = \frac{kx^2}{2}\Big|_0^{0.3} = 12\,J$$

To stretch an additional m...

$$W = \frac{kx^2}{2}\Big|_{0.3}^{1.3} \approx 213.333\ J$$

#53



(a) $\int_0^{1.22378} (2+\sin x - \sec x)\,dx \approx 1.366$

(b) $\pi \int_0^{1.22378} [(2+\sin x)^2 - \sec^2 x]\,dx \approx 16.404$

(c) $A = s^2$

$2+\sin x - \sec x$

$V = \int A(x)\,dx$

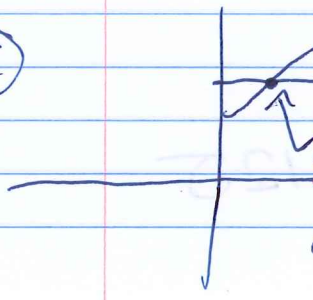
$V = \int_0^{1.22378} (2+\sin x - \sec x)^2\,dx \approx 1.629$

54 (c)

$\text{Cost} = 0.05 \int_{5.23087}^{18.76913} F(t)\,dt \approx \$5.10$

#54 (a) $\frac{1}{14-6} \int_6^{14} F(t)\,dt \approx 87^\circ F$

(b) Graph $F(t)$ and $y = 78$



$5.23087 \leq t \leq 18.76913$ hrs

(c)