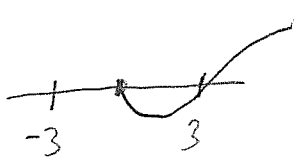
Calc BC Ch 7 Practice Test

1. a. $t^2 - 9 = 0$

$(t-3)(t+3) > 0$

$t > 3 \quad ; v(t) > 0$



Moving to the right when $t > 3$ sec

b. Moving to the left when $t < 3$ sec

c. $\int_0^6 (t^2 - 9)\,dt = \left[\frac{t^3}{3} - 9t\right]_0^6 = \frac{6 \cdot 6 \cdot 6}{3} - 9(6)$

$= 72 - 54 = 18$ units

d. $-\int_0^3 t^2 - 9\,dt + \int_3^6 t^2 - 9\,dt$

$-\left[\frac{t^3}{3} - 9t\right]_0^3 + \left[\frac{t^3}{3} - 9t\right]_3^6$

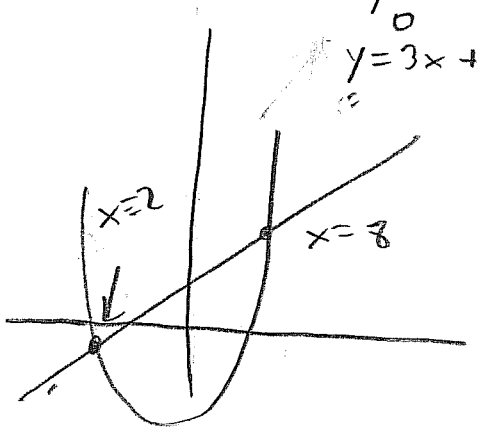
$-[9 - 27] + [72 - 54 - (9 - 27)]$

$18 + 18 + 18 = \boxed{54}$

2. $m(t) = 6.22e^{0.096t}$

$\int_0^{57} 6.22e^{.096t}\,dt = \boxed{\$9659.705 \times 10^9}$

3. $y = 3x + 4$



$y = x^2 - 3x - 12$

$x^2 - 3x - 12 = 3x + 4$

$x^2 - 6x - 16 = 0$

$(x-8)(x+2) = 0$

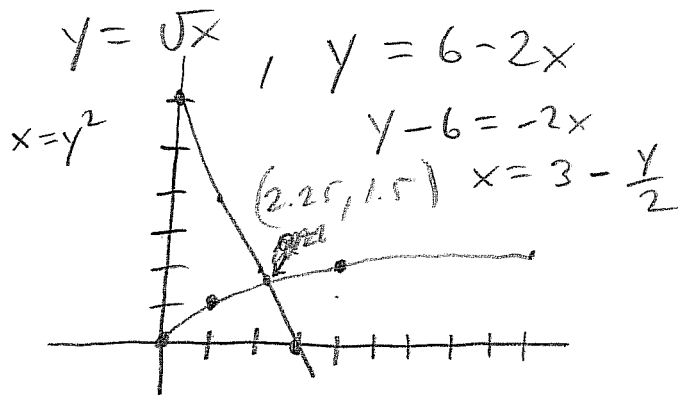
$x = 8 \quad x = -2$

3. continued

$$\int_{-2}^{8} \left(x^2 - 3x - 12 - (3x + 4)\right) dx$$

$$\int_{-2}^{8} x^2 - 6x - 16 \, dx = \boxed{166\frac{2}{3}}$$

4.



$y - 6 = -2x$

$x = 3 - \frac{y}{2}$

$6 - 2x$

$y^2 = 3 - \frac{y}{2}$

$2y^2 = 6 - y$

$2y^2 + y - 6 = 0$

$(2y - 3)(y + 2)$

$y = \frac{3}{2}$

$$\int_{0}^{\frac{3}{2}} \left(3 - \frac{y}{2} - y^2\right) dy =$$

$\boxed{2.813 \ u^2}$

or

base height

$$\int_{0}^{2.25} \sqrt{x} \, dx + \frac{1}{2}(.75)(1.5) = 2.813$$

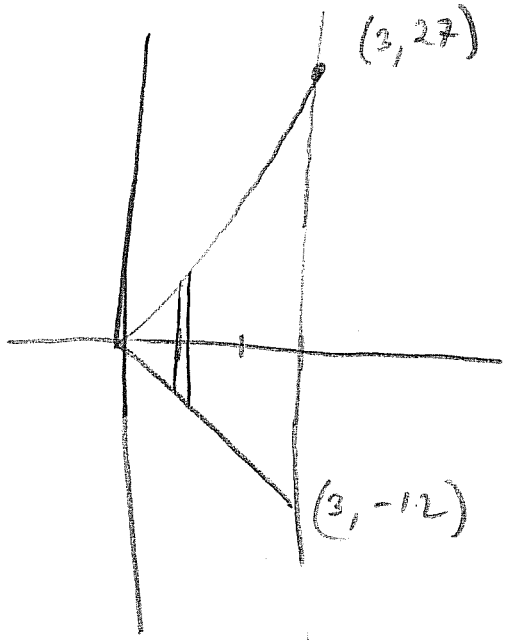
5.

$y = -4x$

$y = x^3$

$x = 0$

$x = 3$

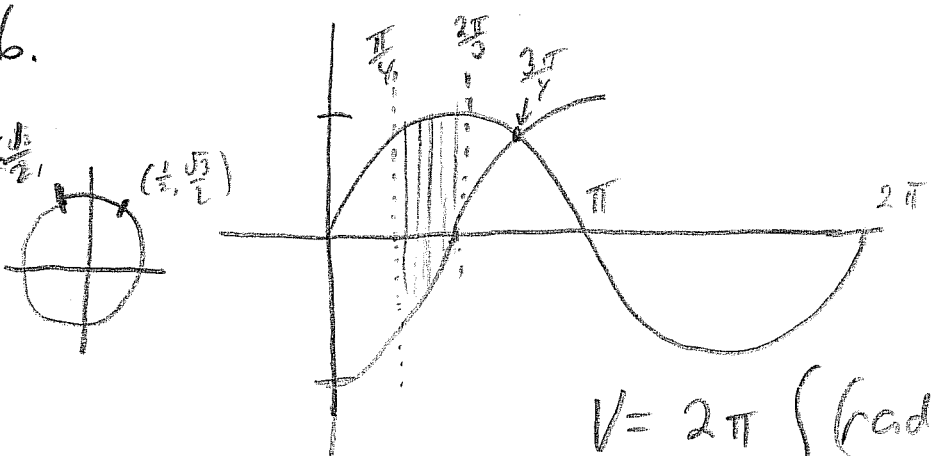


$$V = \int_0^3 A_x \, dx \qquad A_x = \frac{1}{4}\pi r^2 \qquad r = x^3 + 4x$$

$$r^2 = (x^3+4x)^2$$

$$V = \frac{1}{4}\pi \int_0^3 (x^3+4x)^2 \, dx = \boxed{663.841 \ u^3}$$

6.



$$V = 2\pi \int (\text{radius})(\text{height})(\text{thickness})$$

a)

radius $= x$

height $= \sin x + \cos x$

thickness $= dx$

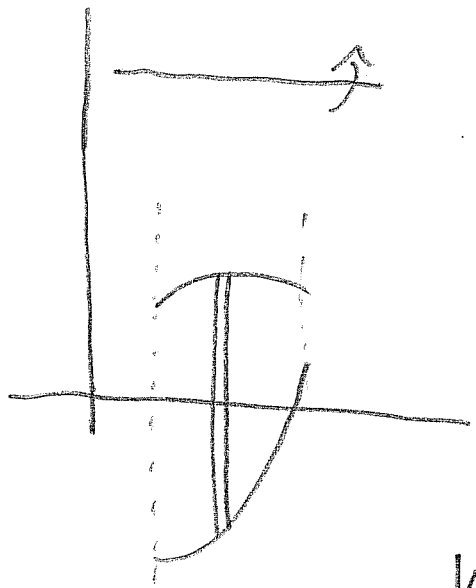
$$V = 2\pi \int_{\frac{\pi}{4}}^{\frac{2\pi}{3}} (x)(\sin x + \cos x) \, dx$$

6 (continued)

$r = \pi - x$

$h = \sin x + \cos x$

b) $2\pi \int_{\frac{\pi}{4}}^{\frac{2\pi}{3}} (\pi - x)(\sin x + \cos x)\, dx$

c) 

$V = \int A_x\, dx$

$A_x = \pi R^2 - \pi r^2$

$R = 8 + \cos x$

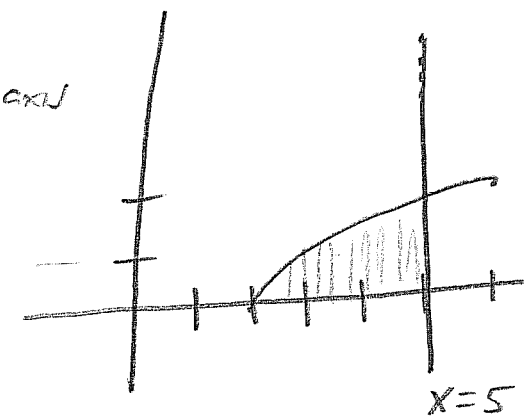
$r = 8 - \sin x$

$V = \pi \int_{\frac{\pi}{4}}^{\frac{2\pi}{3}} (8 + \cos x)^2 - (8 - \sin x)^2\, dx$

7.

$y = 3 - \frac{6}{x}$, $x = 5$, x-axis

a) $A = \int_2^5 \left(3 - \frac{6}{x}\right) dx$



$\left[3x - 6 \ln|x|\right]_2^5$

$15 - 6\ln(5) - 6 + 6\ln 2 = 3.502$

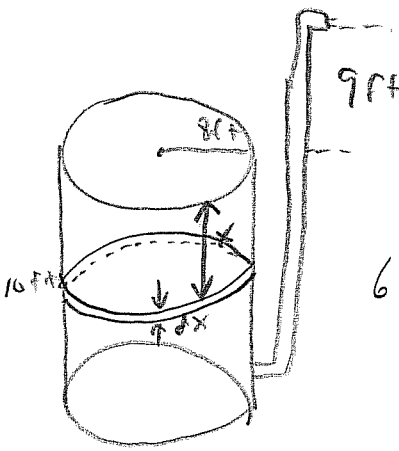
7b.

$$\frac{dy}{dx} = 6x^{-2}$$

$$L = \int_1^5 \sqrt{1+(6x^{-2})^2}\,dx$$

$$= \boxed{6.774}$$

8.



slab weight $= (\pi r^2 dx)(62.4)$

work slab $= 64\pi(62.4)\,dx\,(x+9)$

$$64\pi(62.4)\int_0^{10}(x+9)\,dx = 64\pi(62.4)(140)$$

1,756,477 ft-lbs

9. a) $S(t) = Ce^{kt}$

$S(0) = Ce^0 = 6$ $\boxed{C=6}$

$S(5) = 6e^{k(5)} = 12$

$e^{5k} = 2$

$5k = \ln 2$

$\boxed{k = \frac{1}{5}\ln 2}$

9a (cont) $S(t) = 6e^{\left(\frac{\ln 2}{5}\right)t}$

b) $\int_5^7 6e^{\left(\frac{\ln 2}{5}\right)t}\,dt = \boxed{27.657}$

c) $\int_5^7 S(t)\,dt$ would be the total consumption in billions of gallons from 1985 to 1987.