40elk, 5 yrs 104 elk, L=4,000

$$y = \frac{L}{1+be^{-kt}} \quad \text{or} \quad y = \frac{L}{1+ce^{-kt}}$$

$$\frac{dy}{dt} = ky(4000-y)$$

* k is diff

$$y = \frac{L}{1+ce^{-kt}} \qquad y = \frac{L}{1+ce^{-kLt}}$$

$$40 = \frac{40{,}000}{1+c}$$

$$40 + 40c = 4000$$

$$c = 99$$

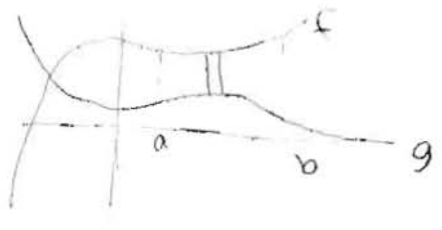
$$104 = \frac{4000}{1+99e^{-5k}}$$

$$e^{-5k} = \frac{4000-104}{(104)(99)}$$

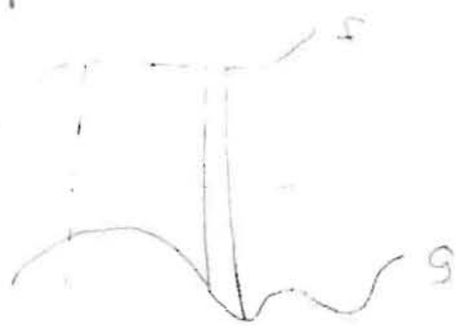
$$-5k = \ln\left(\frac{4000-104}{104(99)}\right)$$

$$k = \frac{\ln\left(\frac{4000-104}{104(99)}\right)}{-5}$$

Chapter 7



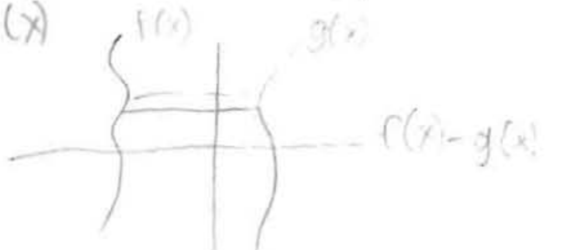
$f(x_i) - g(x_i)$



$f(x_i) - g(x_i)$

$f(x) - g(x)$

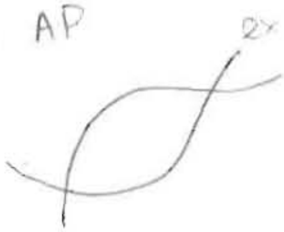
* if function in terms of y, subtract right > left
* if function in terms of x, subtract top - bottom



$$\int_a^b f(x) - g(x)\,dx$$

1

On AP



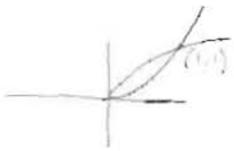
$\cos x^2$

$y_1 = f_1$
$y_2 = g$

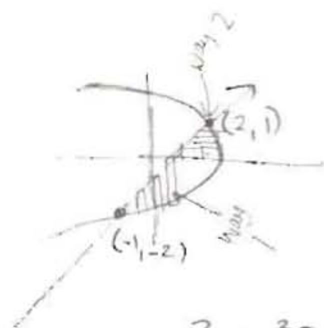
fnInt $(y_1 - y_2, x, a, b)$

$\int_{.123}^{.567} \cos x^2 - e^{x^2}\, dx$

$y = \sqrt{x}$
$x = \sqrt{y}$



12/9/09 $x = 3 - y^2$
$x - y = 1$



$y = x - 1$
$y = \sqrt{3-x}$
$y = -\sqrt{3-x}$

$3 - y^2 = 1 + y$
$0 = y^2 + y - 2$
$0 = (y-1)(y+2)$
$(2,1)\ (-1,-2)$

$\cancel{\int_{-1}^{2} (x-1) - 1 - \sqrt{3-}}$

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

$\frac{x^2}{2} - x - \frac{2}{3}(3-x)^{3/2} \Big]_{-1}^{2} + -2\left(\frac{2}{3}(3-x)^{3/2}\right]_{2}^{3}$

$-\int_{2}^{3} -2\sqrt{3-x}\, dx$
$-2\left(\frac{2}{3}(3-x)^{3/2}\right)$

$(2 - 2 - 2/3) - (\frac{1}{2} + 1 - 16/3) - 4/3\,(0-1)$

$6 - \frac{3}{2}$
$4\frac{1}{2}$

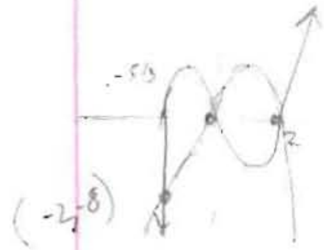
OR

$\int_{-2}^{1} [(3-y^2) - (y+1)]\, dy$

$\int_{-2}^{1} (2 - y^2 - y)\, dy$
$= 2y - \frac{y^3}{3} - \frac{y^2}{2} \Big]_{-2}^{1}$
$= (2 - \frac{1}{3} - \frac{1}{2}) - (-4 + \frac{8}{3} - 2)$
$8 - 3 - 1/2$
$= 4\frac{1}{2}$

$f(x) = 3x^3 - x^2 - 10x = x(3x^2 - x - 10) = x(3x+5)(x-2)$

$g(x) = -x^2 + 2x = -x(x-2)$



$\cancel{x}(3x+5)\cancel{(x-2)} = -\cancel{x}\cancel{(x-2)}$

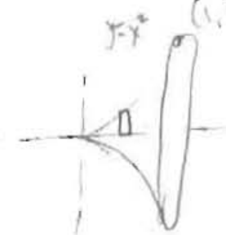
$(3x+5) = -1$

$3x = -6$

$x = -2$

$$\int_{-2}^{0} [(3x^3 - x^2 - 10x) - (-x^2 + 2x)]\,dx + \int_0^2 [((-x^2 + 2x) - (3x^3 - x^2 - 10x)]\,dx$$

Disk Method



- wound on y axis

To find Volume:

$$\lim_{\|\Delta\| \to 0} \sum_{i=1}^{n} \pi (f(c_i))^2 \Delta x_i$$

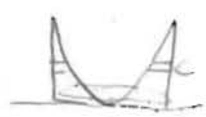
$$\pi \int_a^b (f(x))^2\,dx$$

$$\pi \int_0^1 x^4\,dx$$

$$\pi \left(\frac{x^5}{5}\right)\Big]_0^1$$

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

Washer Method



washer

$\pi R^2 h - \pi r^2 h$

$\pi h (R^2 - r^2)$

* whoever gets differential wins

$1^2 = R \quad x^2 = r^2 \quad h = dy$

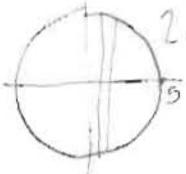
why values →

$$\pi \int_0^1 (1^2 - x^2)\,dy$$

$$\pi \int_0^1 (1-y)\,dy = \pi \left(y - \frac{y^2}{2}\right]_0^1$$

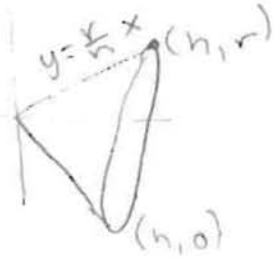
$$\pi(1/2) = \pi/2$$

Dec. 10 $x^2+y^2=25$



$$2\int_0^5 (2y)^2\,dx$$
$$= 2\int_0^5 4\,(25-x^2)\,dx$$

Proving Volume of a Cone



$$\pi\int_0^h \left(\frac{r}{h}x\right)^2 dx$$
$$\frac{\pi r^2}{hh^2}\,\frac{x^3}{3}\Big]_0^h$$
$$\frac{r^2\pi h^3}{3h^2} = \frac{r^2\pi h}{3}$$

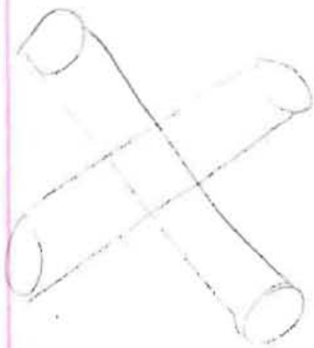
Sphere

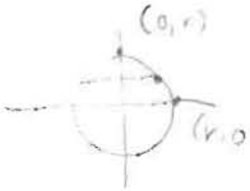
$$y=\sqrt{r^2-x^2}$$
$$2\pi\int_0^r \left(\sqrt{r^2-x^2}\right)^2 dx$$
$$2\pi\left(r^2x-\frac{1}{3}x^3\right)\Big]_0^r$$
$$2\pi\left(r^3-\frac{r^3}{3}\right)-0$$
$$\frac{4}{3}\pi r^3$$

Square Pyramid

$$\frac{-h}{b/2} = \frac{-2h}{b}$$
$$y = -\frac{2h}{b}x + h$$
$$\frac{-b}{2h}(y-h) = x$$
} same line

$$\int_0^h \left[\frac{-b}{2h}(y-h)\right]^2 dy$$ $y-h=du$
$$\frac{b^2}{h^2}\,\frac{(y-h)^3}{3}\Big]_0^h$$
$$\frac{b^2}{3h^2}\left(0--h^3\right)$$
$$= \boxed{\frac{b^2h}{3}}$$



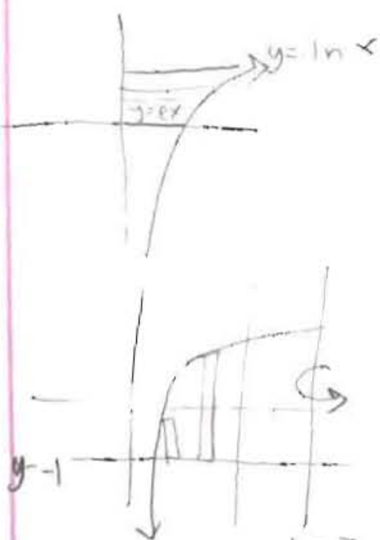


$$2\int_0^r (2x)^2\,dy$$

$$8\int_0^r (r^2-y^2)\,dy = 8\left(r^2y - \frac{y^3}{3}\right]_0^r$$
$$= 8\left(\frac{2r^3}{3} - 0\right)$$
$$= \frac{16r^3}{3}$$

$V = 2\pi r h\,dx$

$$2\pi\int x f(x)\,dx$$



Shell:
$$2\pi\int_{e^{-1}}^{5}(7-x)(\ln x+1)\,dx$$

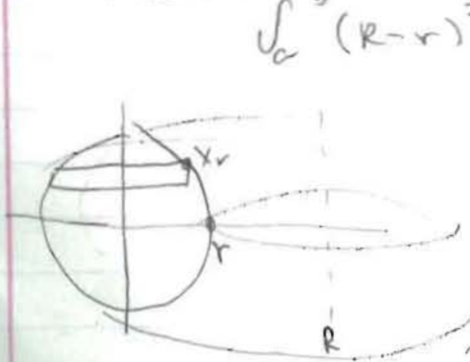
$\ln x = -1$
$x = e^{-1}$

Washer:
$$\pi\int_{-1}^{\ln 5}\left((7-x)^2 - 2^2\right)dy$$

$y = \ln x$
$x = e^y$

$$\pi\int_{-1}^{\ln 5}(7-e^y)^2 - 2^2\,dy$$

* If write $\int_a^b (R-r)^2$, no partial credit on AP



$$\pi 2\int_0^r (R-x_L)^2 - (R-x_R)^2\,dy$$

$x^2+y^2=r^2$
$x = \pm\sqrt{r^2-y^2}$

$$2\pi\int_0^1 \left(R+\sqrt{r^2-y^2}\right)^2 - \left(R-\sqrt{r^2-y^2}\right)^2 dy$$

$$2\pi\int_0^2 \left(R^2 + 2\sqrt{r^2-y^2} + r^2-y^2 - R^2 + 2R\sqrt{r^2-y^2} - (r^2-y^2)\right) d$$

SEMICIRCLE

$8\pi R \int_0^r \sqrt{r^2-y^2}\, dy$

$8\pi R(\frac{1}{4}\pi r^2)$

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