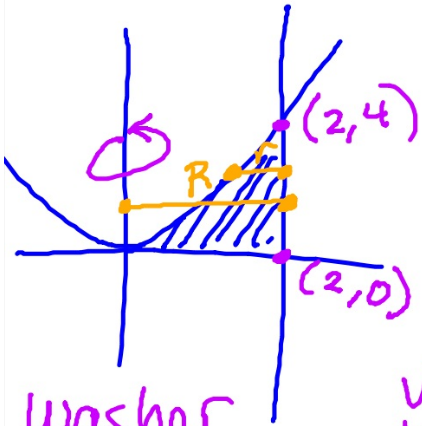
22 $y = x^2$ $x = 2$ x-axis y-axis



$$\pi \int_0^4 \left((2-0)^2 - (\sqrt{y}-0)^2 \right) dy$$

$$\pi \int_0^4 (4-y)\, dy$$

washer
dy

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

3. $\int \frac{dy}{dt} = \int 3000e^{2t/5}\,dt$

$(0, 7{,}500)$

$(5, \_\_\_\_)$

$y = 3000\int e^{2t/5}\,dt$

$= \quad u = 2t/5 \quad du = 2/5\,dt$

$y = 3000 \cdot \frac{5}{2} \int e^{u}\,du$

$y = 7500e^{2t/5} + C$

$0 = C$

$y = 7500e^{2t/5}$

$y(5) = \_\_\_\_$

③ $\frac{dy}{dt} = 3000e^{2t/5}$ $\quad\quad (0, 7500)$

$y(5) = \text{initial} + \text{net change}$

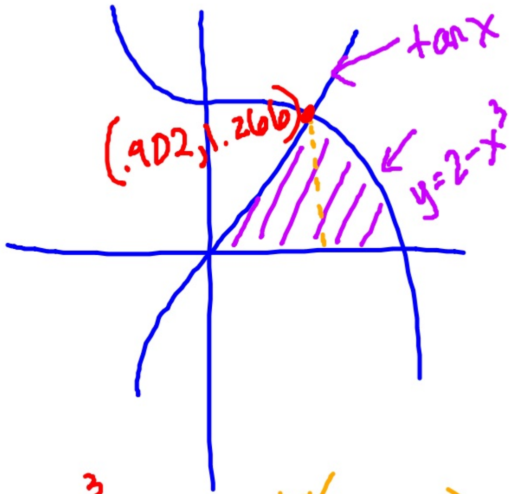
$= 7500 + \int_0^5 3000e^{2t/5}\,dt$

$y(5) = 7500 + 7500e^{2t/5}\Big]_0^5$

$= \cancel{7500} + 7500e^2 - \cancel{7500}$

7a.) Right - left

$$\int_{0}^{1.266} \left(\sqrt[3]{2-y} - \tan^{-1} y\right) dy$$



$$y = 2 - x^3 \qquad \tan^{-1}(y) = \tan^{-1}(\tan x)$$

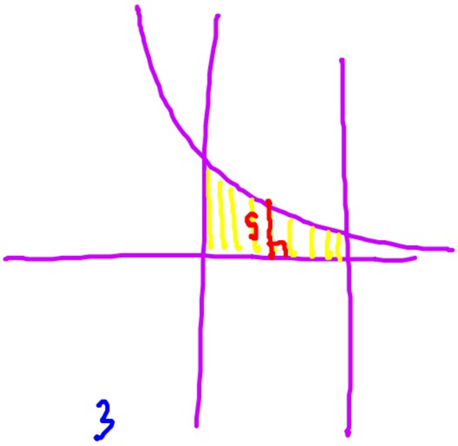
$$\sqrt[3]{2-y} = x \qquad \tan^{-1} y = x$$

10.)

$A = s^2 = (e^{-x} - 0)^2$

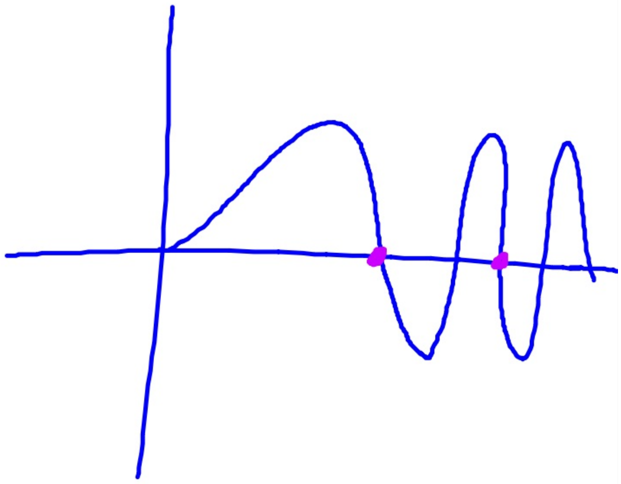
$\int_0^3 \text{Area}\, dx$

$\int_0^3 e^{-2x}\, dx = -\frac{1}{2} e^{-2x} \Big]_0^3$



3d.) Furthest to right (abs. max

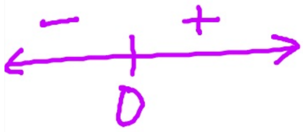
t	
0	5
$\sqrt{5\pi}$	$5+\int_0^{\sqrt{5\pi}} \sin(t^2)\,dt$



2d.) $f(x) = -\dfrac{2}{x^2+1} + 1 = -2(x^2+1)^{-1} + 1$

D: $(-\infty, \infty)$

$f'(x) = 2(x^2+1)^{-2} \cdot (2x)$



$= \dfrac{2x \cdot 2}{(x^2+1)^2}$

$f'(x) = \dfrac{4x}{(x^2+1)^2}$

$(0, -1)$
Abs. min

$f(x) = \dfrac{-2 + x^2 + 1}{x^2+1}$

$f(x) = \dfrac{x^2 - 1}{x^2+1}$

Range $[-1, 1)$

5.) $\frac{dy}{dx} = 2y^2$ $(1,-1)$ $(2, \_\_)$

$\frac{dy}{y^2} = 2dx$

$\int y^{-2} dy = \int 2 dx$

$\frac{y^{-1}}{-1} = 2x + C$

$-\frac{1}{y} = 2x + C$

$1 = 2 + c$

$-1 = c$

$-\frac{1}{y} = 2x - 1$

$-\frac{1}{y} = 3$

$3y = -1$

$y = -\frac{1}{3}$

$$-\frac{1}{y} = \frac{2x-1}{1}$$

$$-y = \frac{1}{2x-1}$$

$$y = \frac{-1}{2x-1}$$

2.) $\int \frac{dy}{y} = \int -2\,dt$ $\quad (0, 1) \quad (\_\_, \frac{1}{2})$

$\ln|y| = -2t + C$

$0 = 0 + C$

$0 = C$

$e^{\ln|y|} = e^{-2t}$

$y = e^{-2t}$

$\ln\frac{1}{2} = \ln e^{-2t}$

$\ln\frac{1}{2} = -2t$

$\ln 1 - \ln 2 = -2t$

$-\ln 2 = -2t$

$\frac{\ln 2}{2} = t$

2c. $\frac{dy}{dx} = x(y-1)^2$ $(0,-1)$

$$\int \frac{dy}{(y-1)^2} = \int x\,dx$$

$$\int (y-1)^{-2}\,dy = \frac{1}{2}x^2 + C$$

$$-1(y-1)^{-1} = \frac{1}{2}x^2 + C$$

$$-1(-2)^{-1} = 0 + C$$

$$\frac{1}{2} = C$$

$$-1(y-1)^{-1} = \frac{1}{2}x^2 + \frac{1}{2}$$

$$\frac{-1}{y-1} = \frac{x^2+1}{2}$$

$$-(y-1) = \frac{2}{x^2+1}$$

$$-y\cancel{+1} = \frac{2}{x^2+1} - 1$$

$$y = \frac{-2}{x^2+1} + 1$$

4a.) $1/2$

$(1,4)$

b.) $y-4=\frac{1}{2}(x-1)$

$1.2 = 1\frac{1}{5}$

$= \frac{6}{5}$

$y=\frac{1}{2}(1.2-1)+4 = 4.1$

c.) $\int y\,dy = \frac{1}{2}\int(3x^2+1)dx$

$\frac{1}{2}y^2 = \frac{1}{2}(x^3+x)+C$

$8=\frac{1}{2}(2)+C$

$7=C$

$2\left(\frac{1}{2}y^2=\frac{1}{2}(x^3+x)+7\right)$

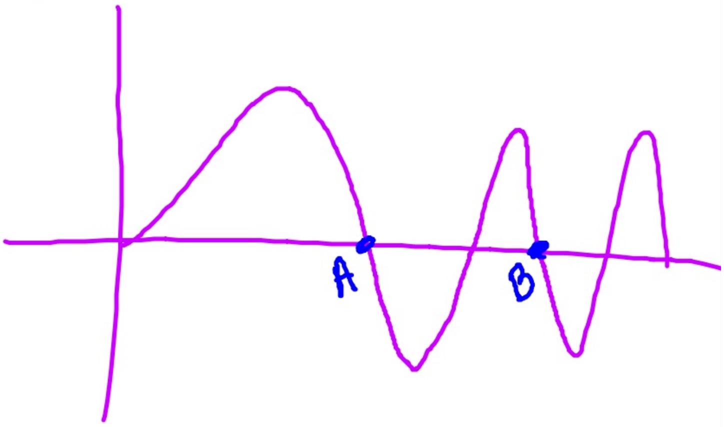
$y^2 = x^3+x+14$

$y=\pm\sqrt{x^3+x+14}$

$y=\sqrt{x^3+x+14}$

3d.) furthest to right
(abs. max)

t	$x(t)$
0	5
A	$5+\int_0^A v(t)\,dt$
B	$5+\int_0^B v(t)\,dt$
$\sqrt{5\pi}$	$5+\int_0^{\sqrt{5\pi}} v(t)\,dt$



6d.) $A(t) = 8t - \frac{2}{3}(t+1)^{3/2} + \frac{92}{3}$

Since t = 63 is the only critical value, and a(t) increases until t = 63 andthen decreases after t = 63, t = 63 is an absolute max

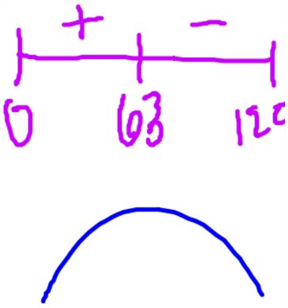
$A'(t) = 8 - (t+1)^{1/2}$

$0 = 8 - (t+1)^{1/2}$

$8 = (t+1)^{1/2}$

$64 = t+1$

$63 = t$



Tuesday (calculator)

Rate in/out
Volume/Area
D.E.

Wednesday (no calculator)

MC
FRQ (D.E., Area/Volume/extra)

3a.) $\frac{dy}{dx} = y^2(6-2x)$

$\left.\frac{d^2y}{dx^2}\right|_{(3,\,1/4)}$

$\frac{d^2y}{dx^2} = y^2(-2) + (6-2x)\cdot 2y\frac{dy}{dx}$

$\frac{d^2y}{dx^2} = \left(\frac{1}{4}\right)^2(-2) + \cancel{(6-2(3))}$

$= \frac{-2}{16}$

4) $\frac{dy}{dx} = \frac{-x}{ye^{x^2}}$ $\quad (0,2)$

$\int y\,dy = \int -xe^{-x^2}dx$ $\quad u = -x^2 \quad -\frac{1}{2} - \int$

$du = -2x\,dx$

$\frac{1}{2}y^2 = +\frac{1}{2}\int e^u\,du$ $\quad 2\left(\frac{1}{2}y^2 = \frac{1}{2}e^{-x^2} + \frac{3}{2}\right)$

$\frac{1}{2}y^2 = \frac{1}{2}e^{-x^2} + C$ $\quad y^2 = e^{-x^2} + 3$

$2 = \frac{1}{2} + C$ $\quad y = \sqrt{e^{-x^2} + 3}$

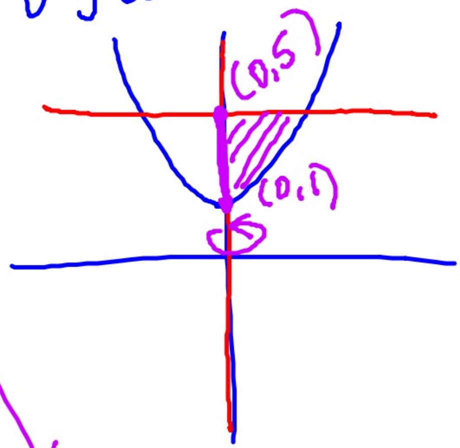
$C = \frac{3}{2}$

14.) $x=0, y=5, y=x^2+1$ ↻ y-axis

disk

$$\pi\int_1^5 \left(\sqrt{y-1}-0\right)^2 dy$$

$$\pi\int_1^5 (y-1)\,dy$$



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

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

11.) $y=4x^2$ $\quad x=1$ $\quad$ x-axis

$$\int \text{Area}\, dx$$

$$\int_0^1 (4x^2)^2\, dx = \int_0^1 16x^4\, dx$$

$$A = s^2 = (4x^2 - 0)^2$$

6b) $t = 3\,\text{min}$ $(0, 30)$

$$s(3) = 30 + \int_0^3 \left(8 - \sqrt{t+1}\right) dt$$

$$= 30 + 8t - \int_0^3 (t+1)^{1/2}\, dt$$

$$= 30 + 8t - \left.\frac{2(t+1)^{3/2}}{3}\right]_0^3$$

2c.)

$$g(x) = \int_{-3}^{x} f(t)\,dt$$

t	$g(t)$
-5	$\int_{-3}^{-5} f(t)\,dt = -\int_{-5}^{-3} f(t)\,dt = 0$
-4	$\int_{-3}^{-4} f(t)\,dt = -\int_{-4}^{-3} f(t)\,dt = -\frac{1}{2}(1)(2) = -1$
4	$\int_{-3}^{4} f(t)\,dt =$ trap $+ \square -$ ⌓

$$\frac{1}{2}\cdot 3(1+2) + 2 - \frac{1}{2}\pi\cdot 1^2$$

$$\frac{9}{2} + 2$$

$$\frac{13}{2} - \frac{\pi}{2}$$