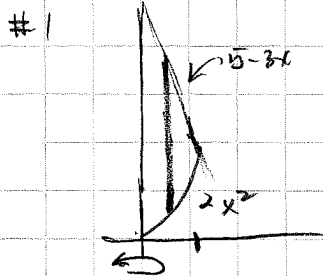


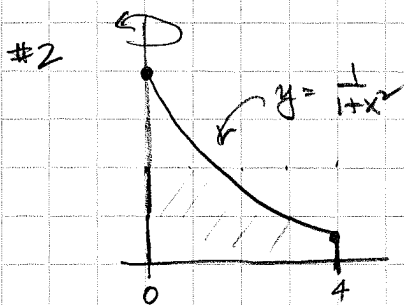
# Math 131 Day 17



$$V = \text{Top} - \text{Bot} = \int_0^1 2\pi x (5 - 3x - 2x^2) dx$$

$$= \pi \int_0^1 10x - 6x^2 - 4x^3 dx = \pi \left[ 5x^2 - 2x^3 - x^4 \right]_0^1$$

$$= \boxed{2\pi}$$



Shells:

$$V = \int_0^4 2\pi x \cdot \frac{1}{1+x^2} dx = \pi \int_0^4 \frac{2x}{1+x^2} dx$$

$u = 1+x^2$   
 $du = 2x dx$   
 $x=0 \Rightarrow u=1$   
 $x=4 \Rightarrow u=17$

$$= \pi \int_1^{17} \frac{1}{u} du = \pi \ln|u| \Big|_1^{17} = \boxed{\pi \ln 17}$$

#3  $f(x) = 2x^{3/2}$ ;  $f'(x) = 3x^{1/2}$

$$AL = \int_a^b \sqrt{1+(f'(x))^2} dx = \int_0^7 \sqrt{1+9x} dx$$

$u = 9x$   
 $du = 9dx$   
 $\frac{1}{9} du = dx$   
 $x=0 \Rightarrow u=1$   
 $x=7 \Rightarrow u=64$

$$= \frac{1}{9} \int_1^{64} \sqrt{u} du = \frac{2}{27} (u^{3/2}) \Big|_1^{64} = \frac{2}{27} [512 - 1] = \frac{1022}{27}$$

#4  $f(x) = \ln(\sec x)$ ;  $f'(x) = \frac{1}{\sec x} \cdot \sec x \tan x = \tan x$

$$AL = \int_0^{\pi/4} \sqrt{1+\tan^2 x} dx = \int_0^{\pi/4} \sqrt{\sec^2 x} dx = \int_0^{\pi/4} \sec x dx$$

$$= \ln|\sec x + \tan x| \Big|_0^{\pi/4}$$

$$= \ln|\sqrt{2} + 1| - \ln|1 + 0| = \boxed{\ln(1 + \sqrt{2})}$$

#5  $f(x) = x^2$ ,  $f'(x) = 2x$

$$AL = \int_a^b \sqrt{1+(f'(x))^2} dx = \int_0^2 \sqrt{1+4x^2} dx = ??$$

Can't do antideriv yet!