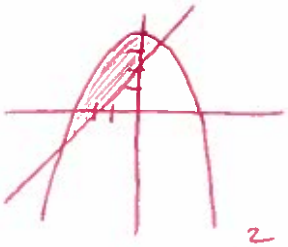
ID and registration, please: Key

AP Calculus AB: 9.4 Volume with Washer Method

1. Consider the functions $f(x) = x + 2$ and $g(x) = -x^2 + 4$.

a. Find the **area** of the enclosed area of the functions f and g.



$$\int_{-2}^{1} (-x^2+4) - (x+2)\,dx = \boxed{\frac{9}{2}}$$

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

$x^2+x-2=0$

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

$x=-2 \quad x=1$

b. Find the **volume** of the enclosed region rotated about the x-axis.

$$\pi\int_{-2}^{1} (-x^2+4)^2 - (x+2)^2\,dx = \boxed{\frac{108\pi}{5}}$$

2. Consider the equations $x = y^2 - 3$ and $x = y - 1$.

a. Find the **area** of the enclosed region of the two equations.

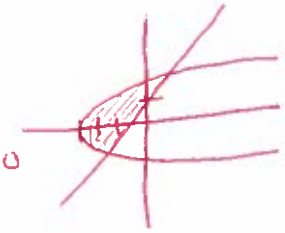
$$\int_{-1}^{2} (y^2-3) - (y-1)\,dy = \boxed{\frac{9}{2}}$$

$y^2-3=y-1$

$y^2-y-2=0$

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

$y=-1 \quad y=2$

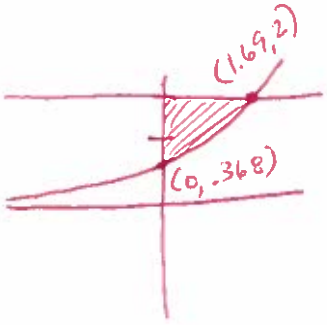


b. Find the **volume** of the enclosed region rotated about the y-axis.

$$\pi\int_{-1}^{2} (y^2-3)^2 - (y-1)^2\,dy = \boxed{\frac{63\pi}{5}}$$

3. (Calculator) Consider the equations $y = e^{x-1}$, $y = 2$, and $y = 0$.

a. Find the **volume** of enclosed region rotated about the x-axis.



$$\pi\int_{0}^{1.69} (2)^2 - (e^{x-1})^2\,dx = \boxed{15.206}$$

b. Find the **volume** of enclosed region rotated about the y-axis.

$$\pi\int_{.368}^{2} (\ln(y)+1)^2 - (0)^2\,dy = \boxed{6.991}$$

$y = e^{x-1}$

$\ln(y) = x-1$

$\ln(y)+1 = x$