AP Calculus AB Name_____
Opener 8.2 Day 4
NO CALCULATOR

Find the area enclosed by the curves.

1. $x = 2 - y^2$ *and* $x = -y$

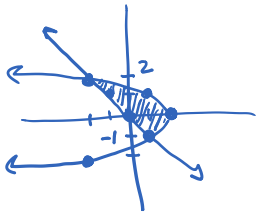
Intersections:

$2 - y^2 = -y$

$0 = y^2 - y - 2$

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

$y = -1, 2$



$$A = \int_{-1}^{2} (2 - y^2 - (-y))\,dy$$

$$= \int_{-1}^{2} (2 - y^2 + y)\,dy$$

$$= \left[2y - \tfrac{1}{3}y^3 + \tfrac{1}{2}y^2\right]\Big|_{-1}^{2}$$

$$= \left(2(2) - \tfrac{1}{3}(2)^3 + \tfrac{1}{2}(2)^2\right) - \left(2(-1) - \tfrac{1}{3}(-1)^3 + \tfrac{1}{2}(-1)^2\right)$$

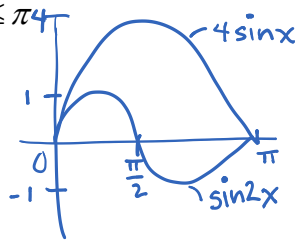
$$= \left(4 - \tfrac{8}{3} + 2\right) - \left(-2 + \tfrac{1}{3} + \tfrac{1}{2}\right)$$

$$= 8 - 3 - \tfrac{1}{2} = 4\tfrac{1}{2} = \boxed{\tfrac{9}{2}}$$

2. $y = 4\sin x$ *and* $y = \sin 2x \quad 0 \le x \le \pi$

$B = 2$

Period $= \frac{2\pi}{2} = \pi$



$$A = \int_{0}^{\pi} (4\sin x - \sin 2x)\,dx$$

$$= \left(-4\cos x + \tfrac{1}{2}\cos 2x\right)\Big|_{0}^{\pi}$$

$$= \left(-4\cos\pi + \tfrac{1}{2}\cos 2\pi\right) - \left(-4\cos 0 + \tfrac{1}{2}\cos 2\cdot 0\right)$$

$$= \left(-4(-1) + \tfrac{1}{2}(1)\right) - \left(-4(1) + \tfrac{1}{2}(1)\right)$$

$$= \left(4 + \tfrac{1}{2}\right) - \left(-4 + \tfrac{1}{2}\right)$$

$$= \boxed{8}$$