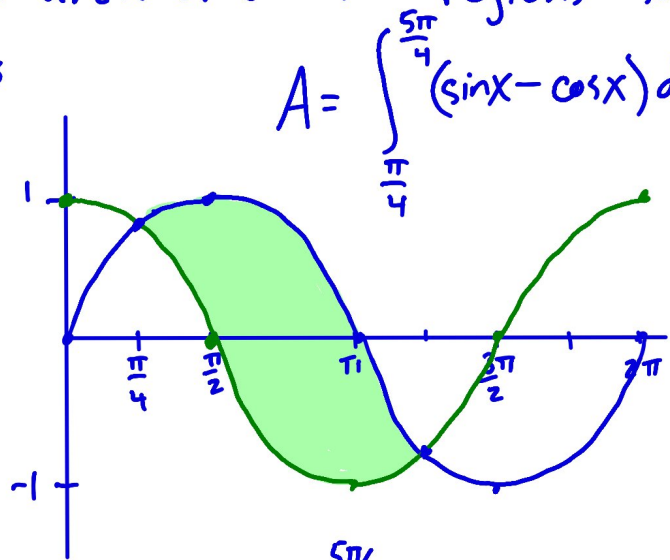


WARMUP

The graphs of $f(x) = \sin x$ and $g(x) = \cos x$ intersect an infinite number of times. Find the ^{exact} area of one the regions formed by those intersections

x	sin x	cos x
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{2}}{2}$



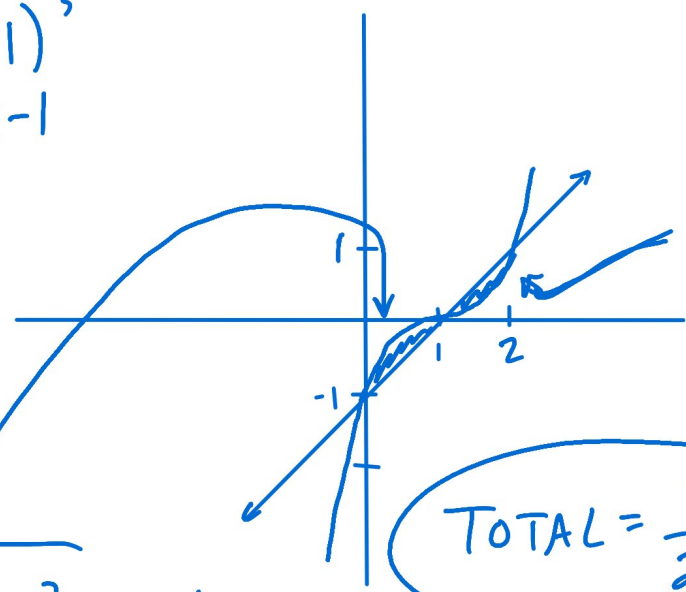
$$A = \int_{\frac{\pi}{4}}^{\frac{5\pi}{4}} (\sin x - \cos x) dx$$

$$= \left[-\cos x - \sin x \right]_{\frac{\pi}{4}}^{\frac{5\pi}{4}}$$

$$= \left(-\cos \frac{5\pi}{4} - \sin \frac{5\pi}{4} \right) - \left(-\cos \frac{\pi}{4} - \sin \frac{\pi}{4} \right)$$

$$= \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$$

3) $f(x) = (x-1)^3$
 $g(x) = x-1$



$$A = \int_0^1 [(x-1) - (x-1)^3] dx = \frac{1}{4}$$

$$A = \int_0^1 [(x-1)^3 - (x-1)] dx = \frac{1}{4}$$

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

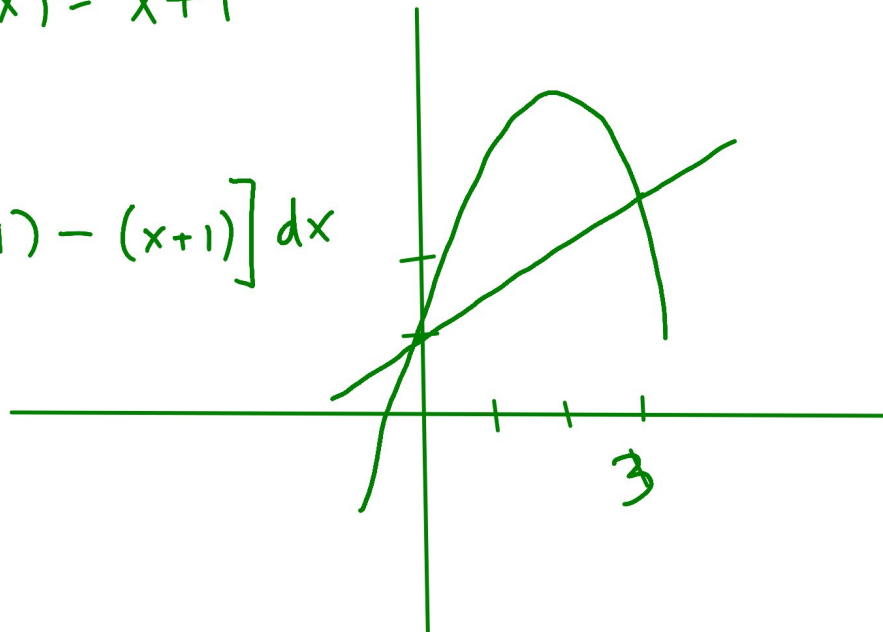
fnInt $((x-1)^3 - (x-1), X, 0, 1)$ ► FRAC

$$4) \quad f(x) = -x^2 + 4x + 1$$

$$g(x) = x + 1$$

$$A = \int_0^3 [(-x^2 + 4x + 1) - (x + 1)] dx$$

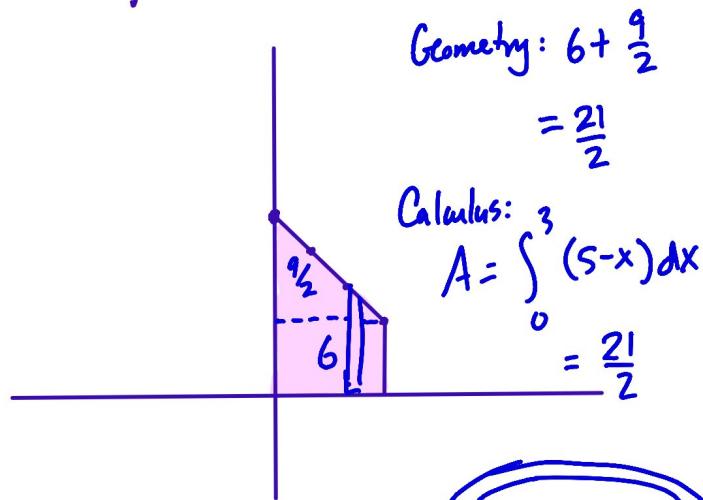
$$= \frac{9}{2}$$



Graph the region bounded by $f(x) = 5 - x$, the y-axis, the x-axis, and the line $x = 3$.
 - Find the area of the region using geometry and Calculus.
 Find the volume when that region is rotated about the y-axis.

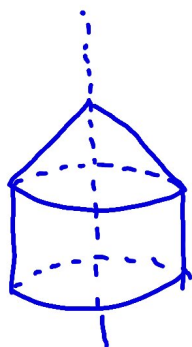
Cone: $V = \frac{1}{3} \pi r^2 h$

Cylinder: $V = \pi r^2 h$



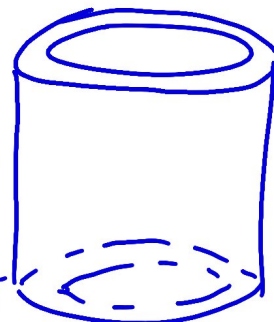
Geometry: $6 + \frac{9}{2}$
 $= \frac{21}{2}$

Calculus: $A = \int_0^3 (5-x) dx$
 $= \frac{21}{2}$



$$\frac{\text{Cone}}{\frac{1}{3} \pi \cdot 3^2 \cdot 3} + \frac{\text{Cylinder}}{\pi \cdot 3^2 \cdot 2}$$

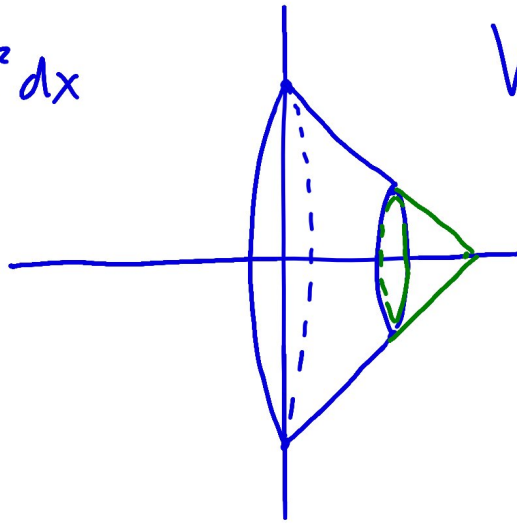
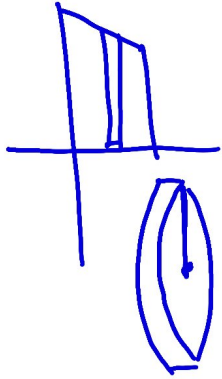
$$9\pi + 18\pi = 27\pi$$



$$V = 2\pi \int_0^3 x(5-x) dx$$

Same region, rotate about the x-axis. What is the volume?

$$V = \pi \int_0^3 (5-x)^2 dx$$



$$V = \frac{1}{3} \pi 5^2 \cdot 5 - \frac{1}{3} \cdot 2^2 \cdot 2$$

$$V = \frac{125\pi}{3} - \frac{8\pi}{3}$$

$$V = \frac{117\pi}{3} = 39\pi$$

Extra Credit Assignment 2

DUE THURSDAY 2/16 by end of class!!!

In 1-3 use substitution

1) $\int x^2 \sqrt{7-3x^3} dx$

2) $\int x^3 e^{7-x^4} dx$

3) $\int \cos x \cdot \cos(\sin x) dx$

In 4 and 5, use table of integrals (blue sheet)

4) $\int \sin^3 x dx$

5) $\int e^{5x} \cos(3x) dx$

In 6 and 7 use trig substitution:

6) $\int \frac{1}{x^2 \sqrt{25-x^2}} dx$

7) $\int \frac{1}{\sqrt{x^2+49}} dx$

In 8 and 9 use parts (or tabular)

8) $\int x^3 e^{3x} dx$

9) $\int x^8 \ln x dx$