$$(f^{-1})'(x) = \frac{1}{f'(f^{-1}(x))}$$

$f(u) = \cot(u)$

$f'(u) = -\csc^2(u)$

$$(f^{-1})'(u(x)) = \underbrace{\boxed{\frac{1}{f'(f^{-1}(u(x)))}}}_{\frac{dg}{dh}} \cdot \underbrace{u'(x)}_{\frac{dh}{dx}}$$

$u(x) = \sqrt{x-1}$

$f = g(h(x))$

$= \cot^{-1}(\sqrt{x-1})$

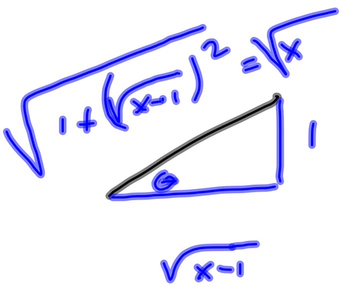
$g(u) = \cot^{-1} u$

$$(f^{-1})'(u(x)) = -\frac{1}{\csc^2(\cot^{-1}(\sqrt{x-1}))} \cdot \frac{1}{2\sqrt{x-1}}$$

$u(x) = \sqrt{x-1} = (x-1)^{\frac{1}{2}}$

$u'(x) = \frac{1}{2}(x-1)^{-\frac{1}{2}}$

$$= \boxed{\frac{1}{2x\sqrt{x-1}}}$$



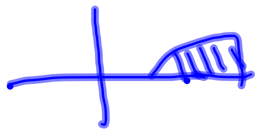
$\csc^2\theta$

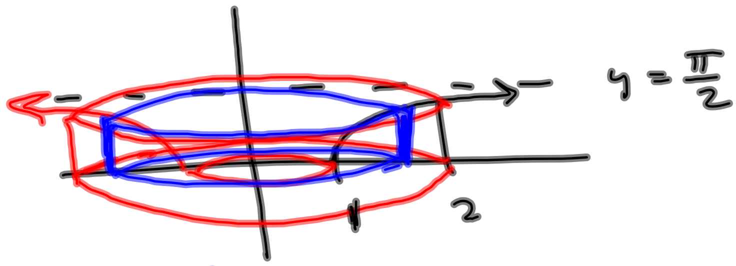
$= \left(\frac{\sqrt{x}}{1}\right)^2 = \sqrt{x}^2 = x$

The arc length factor in
surface area of solid of revolution
crops up in CALC III
These types of constructions to
write integrals come up again
& again.

$$\sum \cdots \Delta x \longrightarrow \int \cdots dx$$ stuff.

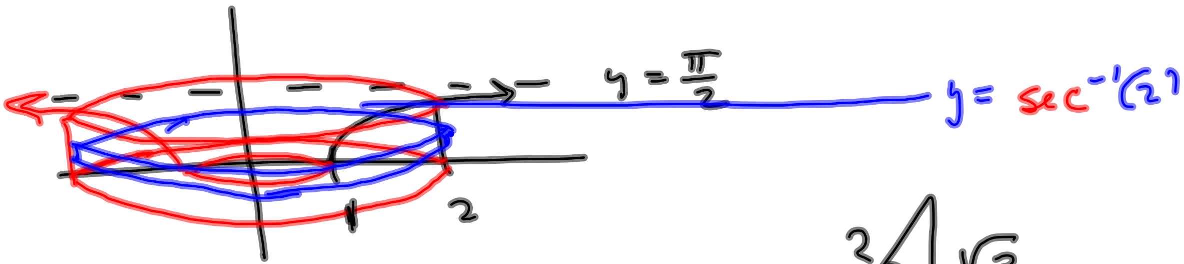
Jan 31-12:24 PM

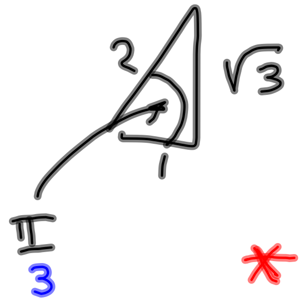




$2\pi \int_1^2 x \sec^{-1} x \, dx$

Shells sucks, with our skill set.





WASHERS $\pi \int_0^{\frac{\pi}{3}} \underline{\text{outer}}^2 - \underline{\text{inner}}^2$

$= \pi \int_0^{\frac{\pi}{3}} (2^2 - \sec^2 y) \, dy$

$y = \sec^{-1} x$

$\sec y = x$

$= \pi \left[4\cancel{x}y - \tan y \right]_0^{\frac{\pi}{3}}$

$= \pi \left[4\frac{\pi}{3} - \sqrt{3} \right]$

WS 02 #1b

Want to use FTC I:

$$\frac{d}{dx}\left[\int_a^x f(t)\,dt\right] = f(x)$$

$$\frac{d}{dx}\left[\int_a^{u(x)} f(t)\,dt\right] = f(u(x))\,u'(x)$$

$$\int_f^g = \int_0^g + \int_f^0 = \int_0^g - \int_0^f$$

My choice of 0 was arbitrary.

No matter, since we're taking the derivative of the thing.

There'd be some concern about Domains for some functions

Jan 31-12:40 PM

WS 02 #22

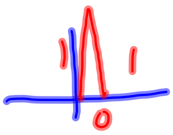
$u = \cot(\omega)$

$du = -\csc^2(\omega)\,d\omega$

$u\left(\frac{\pi}{4}\right)$

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \left(e^{\cot(\omega)} + 1\right)\csc^2(\omega)\,d\omega$$

$$= \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} e^{\cot(\omega)}\csc^2(\omega)\,d\omega + \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \csc^2(\omega)\,d\omega$$



$$= \text{See Solns} + \left[-\cot(\omega)\right]_{\frac{\pi}{4}}^{\frac{\pi}{2}}$$

$$= \text{See Solns} + \left[-0 - (-1)\right]$$

$$= \boxed{\text{See Solns}} + 1$$

answer I gave

$$\lim_{x \to 0} \frac{|x|}{x}$$

Dirac δ-function $= \frac{d}{dx}\begin{bmatrix} 1 \text{ if } x > 0 \\ 0 \text{ if } x \leq 0 \end{bmatrix}$

$$\frac{|x|}{x} = \begin{cases} -1 & \text{if } x < 0 \\ 2 & \text{if } x > 0 \end{cases}$$