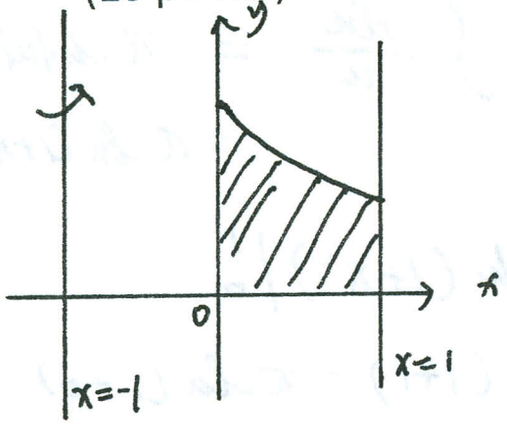
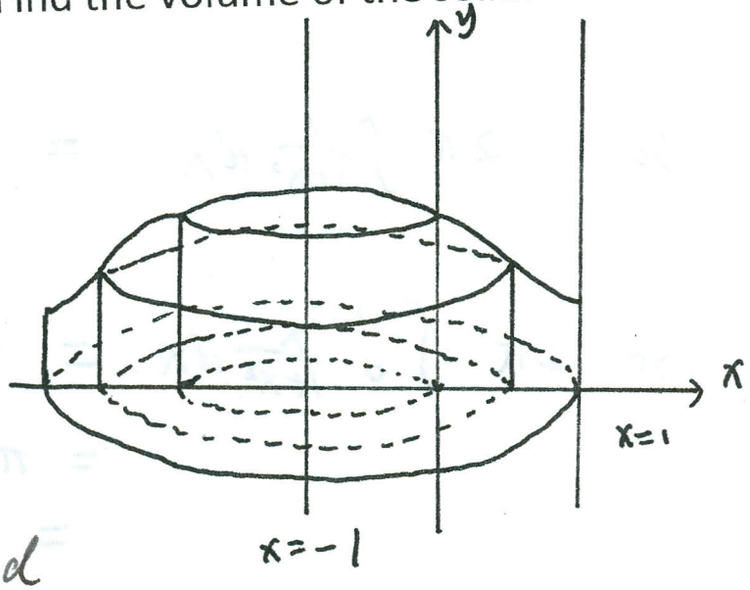
9. We have a region enclosed be the curve $y = \frac{1}{x^2+1}$, the lines $x = 0, x = 1$ and $y = 0$. Rotate the region about the line $x = -1$ we get a solid. Find the volume of the solid. (10 points)





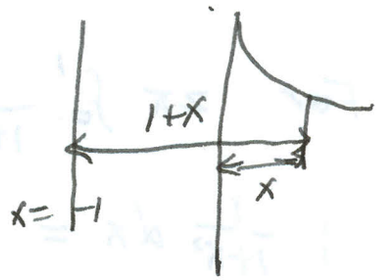
Cylindrical shell method

x is the variable

height $= \frac{1}{x^2+1}$

circumference $= 2\pi r$
$= 2\pi(1+x)$

thickness $= dx$



$a = 0, b = 1$

so $V = \int_0^1 2\pi(1+x)\frac{1}{1+x^2}\,dx$

$= 2\pi \int_0^1 \frac{1+x}{1+x^2}\,dx$

$= 2\pi \int_0^1 \frac{x}{1+x^2}\,dx + 2\pi \int_0^1 \frac{1}{1+x^2}\,dx$