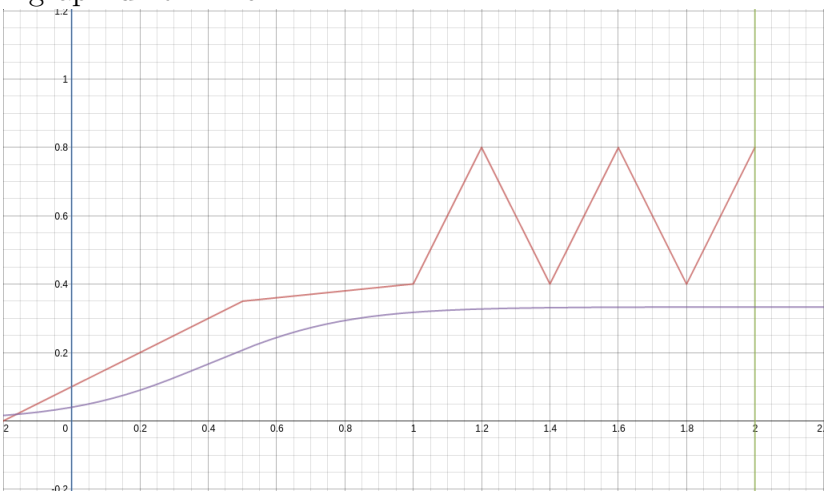
3D printer nozzle for 3 mm diameter filament with a rough approximation of screw threading
Used Ti-*n*spire to solve integrals, and Wolfram Alpha when my calculator was out of arm's reach

1 graph unit = 1 cm



$y = x < 0.5 : 0.5x + 0.1, x < 1 : 0.1x + 0.3, x < 2 : \frac{2}{5\pi} \cdot \arcsin\left(\sin\left(4\pi \cdot x - \frac{3\pi}{2}\right)\right) + 0.6$
$y = \frac{1}{3(1+e^{-(5x-2)})}$

Area under piecewise function:
$\int_0^{0.5} \frac{1}{2}x + \frac{1}{10}\,dx = 0.1125$
$\int_{0.5}^{1} \frac{1}{10}x + \frac{3}{10}\,dx = 0.1875$
$\int_1^2 \frac{2}{5\pi} \arcsin\left(\sin\left(4\pi \cdot x - \frac{3\pi}{2}\right)\right) + 0.6\,dx = 0.6$
Total: 0.9

Area under sigmoid function:
$A(x) = \int \frac{1}{3(1+e^{-(5x-2)})} = \frac{1}{15} \cdot \ln\left(e^{5x} + e^2\right)$
$A(x)|_0^2 = \frac{1}{15} \cdot \ln\left(e^{10} + e^2\right) - \frac{1}{15} \cdot \ln\left(e^0 + e^2\right)$
$= \frac{1}{15} \cdot \left(2 - \ln\left(1 + e^2\right) + \ln\left(1 + e^8\right)\right)$
≈ 0.525

Area between functions:
0.375

Volume:

$\int_0^{0.5} 2\pi((0.5x+0.1)-(\frac{1}{3(1+e^{-(5x-2)})}))\,dx$
≈ 0.352
$\int_{0.5}^{1} 2\pi((0.1x+0.3)-(\frac{1}{3(1+e^{-(5x-2)})}))\,dx$
≈ 0.309
$\int_1^2 2\pi((\frac{2}{5\pi}\cdot \arcsin(\sin(4\pi\cdot x-\frac{3\pi}{2}))+0.6)-\frac{1}{3(1+e^{-(5x-2)})})\,dx$
≈ 1.70
Total $= 0.352+0.309+1.7 = 2.361\text{cm}^3$

Use for shape: Nozzle for 3D printer hotends; attaches to heater block and melts a filament of plastic 3mm in diameter and extrudes it at 0.4mm.

Material of choice: Brass.
Density of brass: 8.7 g/cm^3
Total weight of object: $8.7 * 2.361 = 20.5407g$

Sketch: