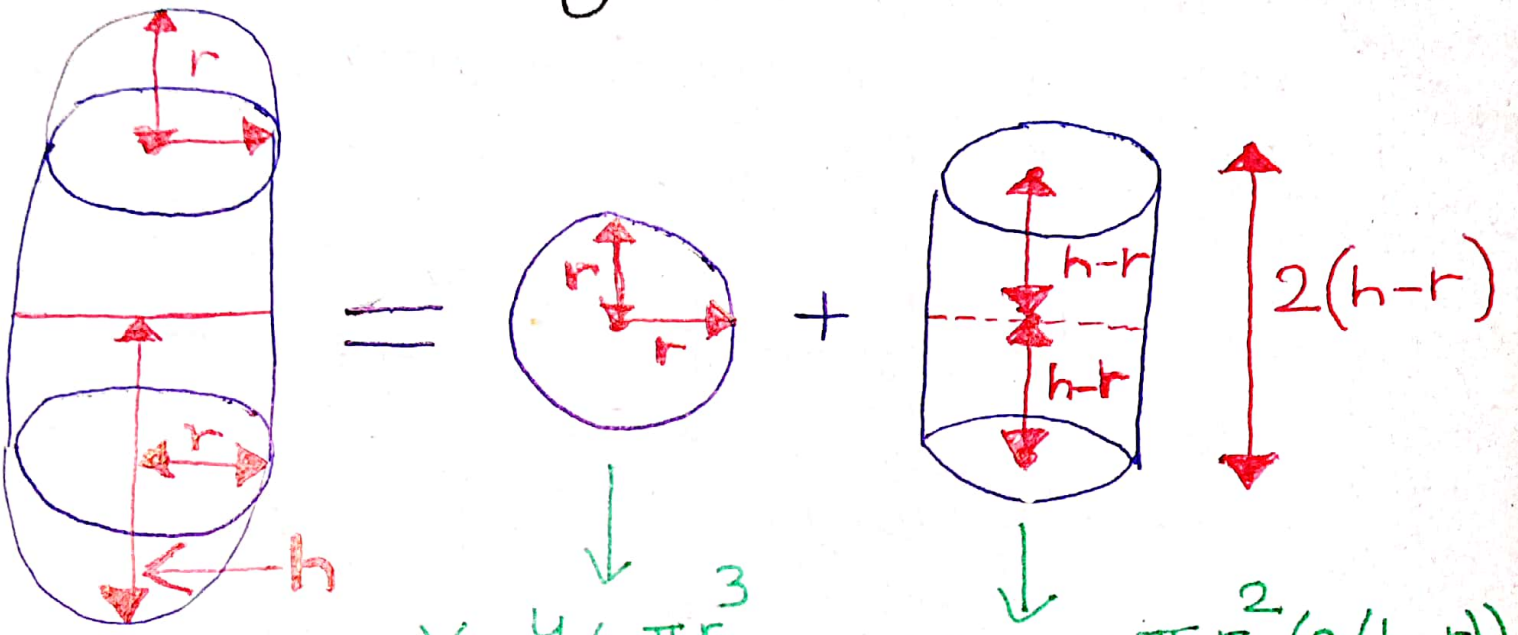
A cylinderical vertical fuel tank



$V_{Sphere} = \frac{4}{3}\pi r^3$

$V_{Cylinder} = \pi r^2 (2(h-r))$

$V_{Tank} = \frac{4}{3}\pi r^3 + 2\pi r^2 (h-r)$ ← $h \geq 15$, $h \geq r$ to hold

$= \pi r^2 \left[\frac{4}{3}r + 2h - 2r\right]$

$r = 15$ inches (Given)

$= 225\pi \left[20 + 2h - 30\right]$

$= 225\pi \left[2h - 10\right]$ inches^3

$h \geq 5$ (Volume is positive)

$h \geq 15$
$h \geq 5$
↓
$h \geq 15$

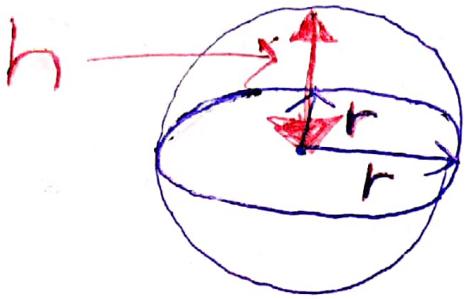
1 Gallon = 231 Cubic inch

1 Cubic inch = $\frac{1}{231}$ Gallon

$= \frac{225}{231}\pi \left[2h - 10\right]$ Gallon

Mathematical model would not remain the same for height between 0 and 15.

There would be no cylinderical portion within this range.



$0 \leq h < 5$

$r = 15$

$$\text{Volume}_{\text{Ellipse}} = \frac{4}{3}\pi r^2 h \text{ cubic inch}$$

$$V_{\text{Ellipse}} = \frac{4}{3 \times 231}\pi r^2 h \text{ Gallon}$$

$$= \frac{4}{693}\pi r^2 h \text{ Gallon}$$