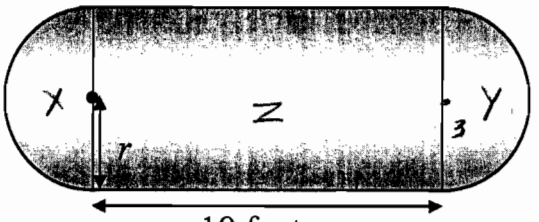
Propane Tanks

T1

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape, in different sizes.

The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

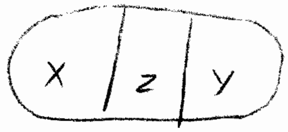
What should the radius of the new tank be? ≈ 4.0459 ft.

Explain your thinking and show your calculations.

Using the Guess + Check method, I can derive a range and alter place digits to get the desired number = 252, and solve the cubic equation.

T1

Propane Tanks (continued)



V of cylinder = $\pi r^2 h$

V of sphere = $\frac{4}{3}\pi r^3$

6ft diameter = 2(3f radius)

h=10

$X+Y=$ 1 sphere

$X+Z+Y=$ volume

$\frac{27}{1}\cdot\frac{4}{3}\pi = \frac{108}{3}\pi = 36\pi$

$10\cdot 9\cdot\pi = 90\pi$

current volume = 126π

↓

double = 252π

$10r^2\pi + \frac{4}{3}\pi r^3 = 252\pi$

$10r^2 + \frac{4}{3}r^3 = 252$

3.5 as r is too small ⇒ 179 2/3

4 as r is too small ⇒ 245 1/3

4.5 as r is too big ⇒ 324

r must be between 4 & 4.5

4.25 as r is too big ⇒ 282.4151667

4.125 is ~~2 small~~ too big ⇒ 263 1421875

must be between 4 & 4.125

4.0625 is ⇒ 254.4332214 (too big)

4.048 ⇒ 252.3053866

4.046 ⇒ 252.01245

(252)

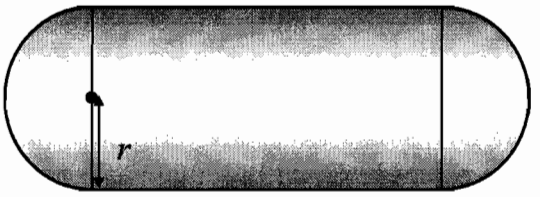
4.0459 = 251.9978343

Propane Tanks

T2

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape, in different sizes.

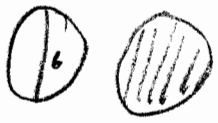
The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

What should the radius of the new tank be? 4,24 ft

Explain your thinking and show your calculations.

If you double the whole capacity of the tank, then work back wards, you get 4,24 ft as the new radius



$4/3 \cdot \pi 3^3$ $\quad \pi r^2 \cdot 10$

$4/3$ 27π $\quad 9\pi \cdot 10$

36π + 90π = 126π

X2 72π + 180π = 252π

$4/3\, r^3$ + $r^2, 10$ = 252

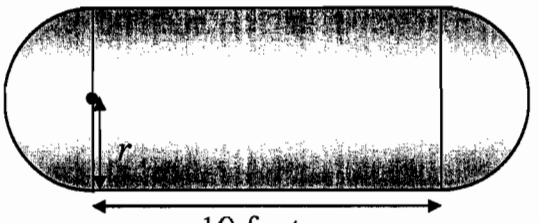
$r^2 = 18$ $\quad r =$

Propane Tanks

T3

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape, in different sizes.

The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

What should the radius of the new tank be? 4

Explain your thinking and show your calculations.

if diameter is 6, capacity of new tank must be 246π ft^2. the equation for new tank volume is $10r^2\pi + \frac{4}{3}\pi r^3 = 246\pi$, simplify that into $5r^2 + \frac{2}{3}r^3 = 123$ if $r=4$, (due to guess and checking and thinking how 4^2 is about 3^2 times two), than $5r^2 + \frac{2}{3}r^3 = 122\frac{2}{3}$, $122\frac{2}{3}$ is pretty close to 123 so 4 it should be,

Propane Tanks (continued)

$r=3$

$9\pi \times 10 = 90\pi$

$\frac{4}{3}\pi r^3 = 36\pi$

$90\pi + 36\pi = 126\pi$

252π ← capacity of new tank

$10\pi r^2 + \frac{4}{3}\pi r^3 = 252\pi$

$10r^2\pi + \frac{4}{3}\pi r^3 = 252\pi$

$10r^2 + \frac{4}{3}r^3 = 252$

$5r^2 + \frac{2}{3}r^3 = 126$

$15r^2 + 2r^3 = 378$

[illegible]

r = about 4.05 (from g and c)

$42\frac{2}{3}$

16
1
64

$\frac{128}{3} = 42\frac{2}{3}$

16
5
80

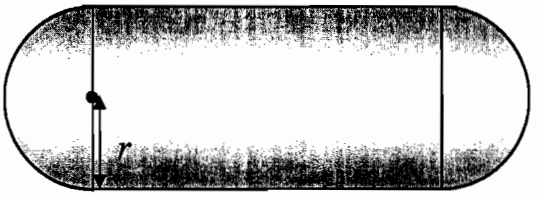
$80 + 42\frac{2}{3} = 122\frac{2}{3}$

Propane Tanks

T4

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape, in different sizes.

The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

What should the radius of the new tank be? _____

Explain your thinking and show your calculations.

sphere volume = $4/3\,\pi r^3$, column = πr^2

the new diameter is x

$4/3\,\pi \cdot x^3 + 10\pi x^2 = 2\left[\left(4/3\,\pi \cdot 3^3\right) + 10 \cdot \pi 3^2\right]$

$4/3\,x^3 + 10x^2 = 8 \cdot 9 + 20 \cdot 9 = 252$

$r=4$ $4/3 \cdot 64 + 10.16 = 245$ too small

$r = 4.1$ $4/3 \cdot 4.1^3 + 10 \cdot 4.1^2 = 259$ too big

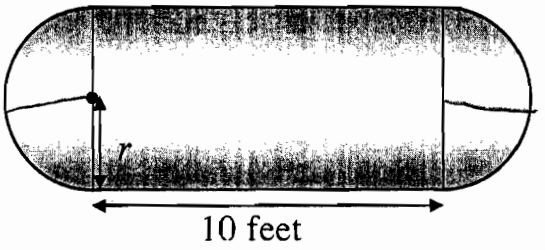
$r = 4.05$ $4/3 \cdot 4.05^2 + 10 \cdot 4.05^2 = 185$ too small

Propane Tanks

T5

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape, in different sizes.

The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

What should the radius of the new tank be? 4.05 ft

Explain your thinking and show your calculations.

$\frac{4}{3}\pi 3^3 = V$

$\frac{4}{3}\pi r^3$ = volume of a sphere $V = \frac{4}{3}\pi 27$

$V = \pi 3^2 \cdot 10$ $V = 36\pi$

$= 9\pi \cdot 10$ $V = 113.097\ ft^3$

$= 90\pi$

$= 282.743\ ft^3$

Standard Tank Total V = 282.743 ÷ 113.097

$= 395.84\ ft^3$ or 126π

Propane Tanks (continued)

$$2(126\pi) = \pi r^2 10 + \tfrac{4}{3}\pi r^3$$
$$252 = 10r^2 + \tfrac{4}{3}r^3$$
$$189 = 7\tfrac{1}{2}r^2 + r^3$$
$$0 = r^3 + 7\tfrac{1}{2}r^2 - 189$$
$$r = 4.05$$