Investigating Best Design of Cylinders

Name: _____

PART 1:

Your GOAL is to determine the height of a CYLINDER that will give the MINIMUM (smallest) surface area.

You will need to rearrange the formula for Volume of a Cylinder to isolate height (h):

$V = \pi r^2 h$

$= h$

Also, recall surface area formula for a cylinder:

_____

1. Calculate the height needed to have the given volume for each radius, then calculate the surface area. An example is done for you.

Radius	Height Calculations (show your work)	Height	Volume	Surface Area Calculations (show your work)	Surface Area
1	$h = \frac{785.4}{\pi(1)^2}$	250.0m	785.4m^3	$SA = 2\pi(1)^2 + 2\pi(1)(250)$	1577.1m^2
2			785.4m^3		
3			785.4m^3		
4		15.6m	785.4m^3		
5		10.0m	785.4m^3		
6		6.9m	785.4m^3		
7		5.1m	785.4m^3		
8		3.9m	785.4m^3		
9		3.0m	785.4m^3		
10		2.5m	785.4m^3		

2. Circle the line that will give the smallest surface area. What height will give the MINIMUM surface area?

3. Write a conclusion about the relationship between the radius and the height that will give the minimum surface area.

4. Use your conclusion to determine the radius of a cylinder that will have the smallest surface area if its height is 60cm.

PART 2:

Your GOAL is to determine the height of a CYLINDER that will give the MAXIMUM (largest) volume.

You will need to rearrange the formula for Volume of a Cylinder to isolate height (h):

$$SA = 2\pi r^2 + 2\pi rh$$

Also, recall volume formula for a cylinder:

$$= h$$

_____

1. Calculate the height needed to have the given volume for each radius, then calculate the surface area. An example is done for you.

Radius	Height Calculations (show your work)	Height	Surface Area	Volume Calculations (show your work)	Volume
1	$h = \frac{471.24 - 2\pi(1)^2}{2\pi(1)}$	74.0m	471.24m^2	$V = \pi(1)^2(74.0)$	232.48m^3
2			471.24m^2		
3			471.24m^2		
4		14.8m	471.24m^2		
5		10.0m	471.24m^2		
6		6.5m	471.24m^2		
7		3.7m	471.24m^2		
8		1.4m	471.24m^2		
9		0.7m	471.24m^2		

2. Circle the line with the largest volume. What height will give this MAXIMUM volume?

3. Write a conclusion about the relationship between the radius and the height that will give the maximum volume.

4. Use your conclusion to determine the height of a cylinder that will have the largest volume if its radius is 105cm.