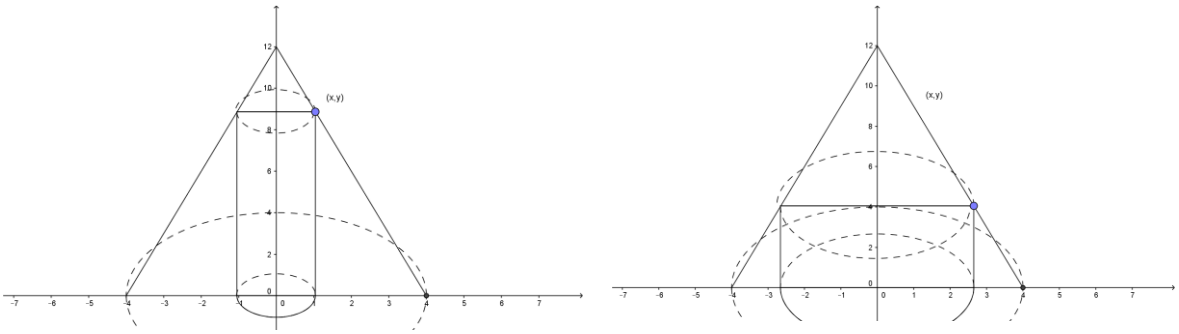
Maximal cylinder in a cone optimisation problem.



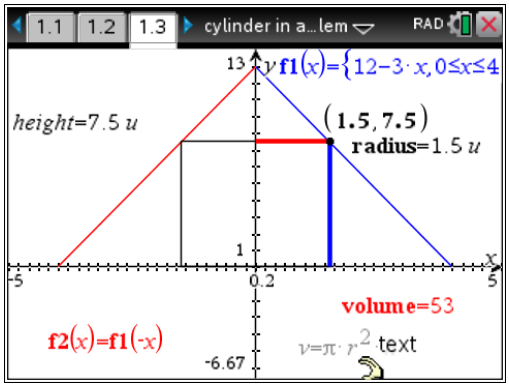
The figures show cylinders inscribed in a cone. The cone has radius 4 cm and height 12 cm.

In this activity you will learn how to find the dimensions that give the inscribed cylinder its maximum volume.

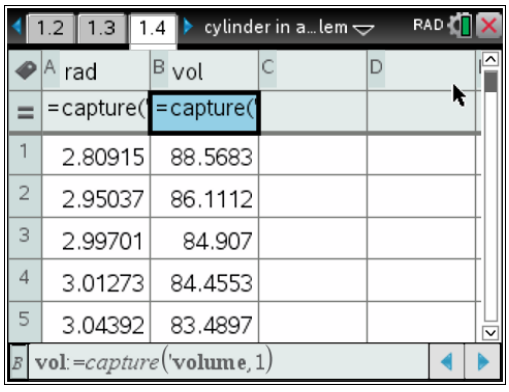
Next page will have a construction done for you. By dragging the point you can vary the shape of the inscribed cylinder and observe how the volume changes.

Alternatively you can retype the number for radius.

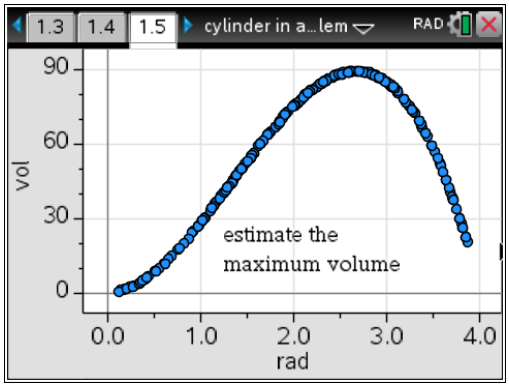
Calculate the volumes of cylinders with radius equal to 0, 1, 2, 3 and 4 cm.



Using data capture feature we will capture radius and volume by dragging the point back and forth.



And plot the results using data & stats graph:

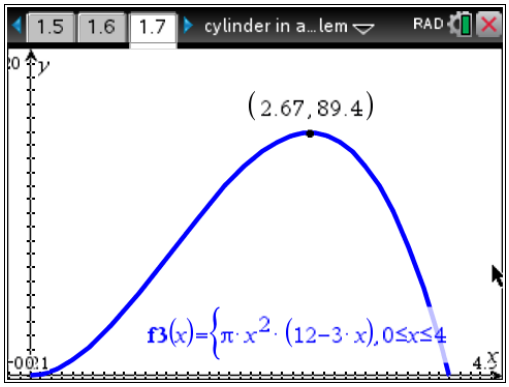


Now using calculus:

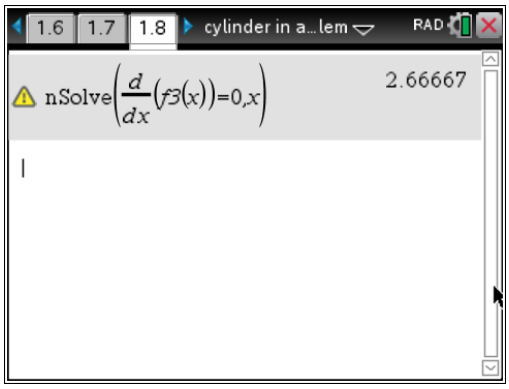
Write the volume of a cylinder in terms of radius.

You may find it useful to determine the equation of the straight line segment that the sample point (r,h) or (x,y) lies on.

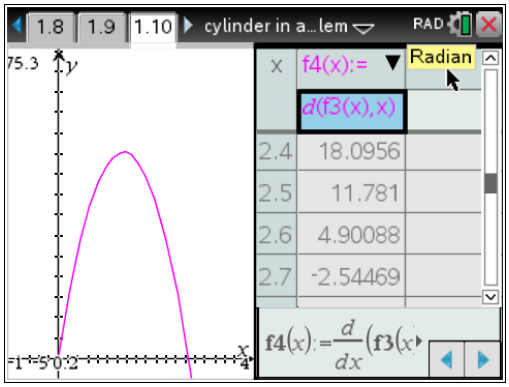
Sketch the volume versus radius function over the appropriate domain.



How do the two graphs compare?



How can you show using calculus that it is a maximum value?


1.8
1.9
1.10
cylinder in a...lem
RAD
75.3
y
x
-1
5
0.2
4
x
f4(x):=
Radian
d(f3(x),x)
2.4
18.0956
2.5
11.781
2.6
4.90088
2.7
-2.54469
f4(x):=d/dx(f3(x