

Problem statement An oil tank has the shape of a cylinder whose diameter is 4 feet. It is mounted so that the axis of the cylinder is horizontal (the circular cross-sections of the cylinder are vertical). If the depth of the water is 3 feet, what percentage of the total capacity of the tank is filled?

After drawing a picture and setting up this problem, solve it three ways:

- a) Use elementary geometry (compare areas of circular sectors).
- b) Express the answer in terms of a definite integral, then obtain an approximate numerical value for the integral using the `fnInt(` function on your calculator.
- c) Evaluate the integral in b) exactly in terms of elementary functions using a trig substitution, then obtain approximate numerical values for these functions using your calculator.