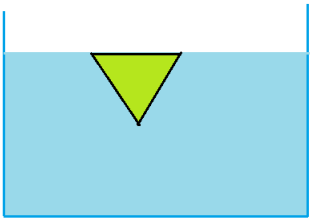
1. Find the length of the curve $y^2 = 4(x+4)^3$, $0 \leq x \leq 2$, $y > 0$.
2. Find the arc length function of the curve $y = sin^{-1}x + \sqrt{1-x^2}$ with starting point at $(0, 1)$
3. A spherical tank of radius R meters is ful of water. If the density of water is ρ and gravitational acceleration is g, Find the work required to pump the water out from the top of the sphere.
4. A plate is in the shape of an equilateral triangle with length of edge d. It is submerged into water vertically with one edge at the surface of water. If the density of water is ρ and gravitational acceleration is g, compute the hydrostatic force against one side of the plate.



5. Find the centre of mass of the region bounded by $y = x^2$, x-axis and $x = 1$.
6. Find the centre of mass of the region bounded between the circles $(x+1)^2+y^2 = 1$ and $x^2 + y^2 = 4$.