Section 9.6: Hydrostatic Pressure and Force

• The hydrostatic force on a *HORIZONTAL* plate is $F = \rho g d A$ where ρg is the weight density of the liquid, d is the depth of the plate, and A is the area of the plate.

• The hydrostatic force on a *VERTICAL* plate requires integration. Take a small vertical strip of water with area A. Then $F = \int \rho g d A \, dy$, where d is the depth of the vertical strip. The limits of integration depends on how you define your axes.

1. A pool 5 m wide, 10 m long and 3 m deep is filled with a fluid of density $\rho g = 1030$ kg per cubic meter.

   a.) Find the force on the bottom of the pool.

   b.) Find the force on one end of the pool.

2. A vertical plate is submerged in water, where the top of the plate is located at the water level. Find the force of the water on one side of the plate described below:

   a.) Semicircle of diameter 4 feet, with the diameter at the top.

b.) Isosceles triangle with height 6 meters, base length 2 meters with vertex at the bottom.

c.) The region bounded by $y = x^2$, $y = 4$, where units are in feet.

3. Find the force of water on the plate shown below:

Triangluar plate submerged in fluid