Hydrostatic Force

1. We have a triangle shaped swimming pool formed by the lines $y = -2x, y = 0$ and $x = 5$, which is completely filled up with water.
   (a) Draw a picture of the pool
   (b) Carefully label your axes. Include the water level and bottom of the pool.
   (c) Set up an integral for the force of the water at the bottom.
   (d) Solve the integral from (c).

2. A triangular plate with base 3 meters and height 5 meters is placed 2 meters underwater as shown. Label your coordinates clearly on the vertical axis on the right, then compute the hydrostatic force on the plate. You may use $\rho$ for the density of the water and $g$ for the acceleration due to gravity.

3. Find the hydrostatic force on the plate in the following picture.
Center of Mass

1. Find the center of mass of the following lamina

![Diagram of lamina with coordinates](image)

2. A lamina has the shape of a right triangle of height \( t \) and base \( r \) (meters). The base lies along the \( x \)-axis. It has density \( \rho \) kg/m\(^2\)

   (a) Make a careful diagram of the problem
   (b) Find the moment \( M_x \) about the \( x \)-axis. Your answer will involve \( \rho, L, \) and \( r \).

3. Consider the lamina \( L \) in the plane of constant density \( \rho \), which is bounded by the curves

   \[ x = 5 - y^4, x = y^2 - 1. \]

   (a) Find \( M_x \).
   (b) Find \( M_y \)
   (c) Find the center of mass of \( L \).

Approximation:

1. Suppose the sum of the series \( \sum_{k=1}^{\infty} \frac{1}{(2n+1)^2} \) is approximated by its 4th partial sum, \( s_4 = \frac{1}{9} + \frac{1}{25} + \frac{1}{49} + \frac{1}{81} \). Find the maximum possible error in this estimation.

2. How many terms do we need to approximate \( \sum_{n=1}^{\infty} \frac{1}{n^2} \) up to 2 decimal places?

3. Suppose the sum of the series \( s = \sum_{k=1}^{\infty} \frac{1}{k^2} \) is approximated by its 3rd partial sum, \( s_3 = 1 + \frac{1}{4} + \frac{1}{8} \).

   Approximate the maximum possible error in this estimation.