# Exam 2 Review Session

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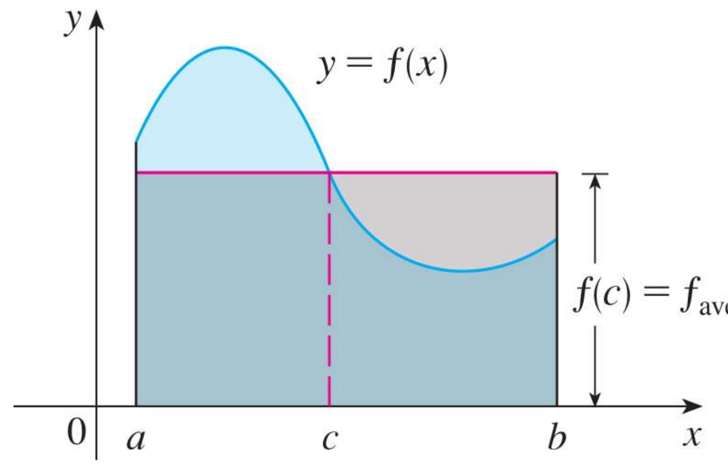
Given a function $f(x)$, the **average value of** $f$ on the interval $[a, b]$ is

$$f_{\text{avg}} = \frac{1}{b-a} \int_a^b f(x)\ dx$$

**Mean Value Theorem for Integrals.** If $f$ is continuous on $[a, b]$, then ther exists a number $c$ in $[a, b]$ such that

$$f(c) = f_{\text{avg}} = \frac{1}{b-a}\int_a^b f(x)\ dx$$



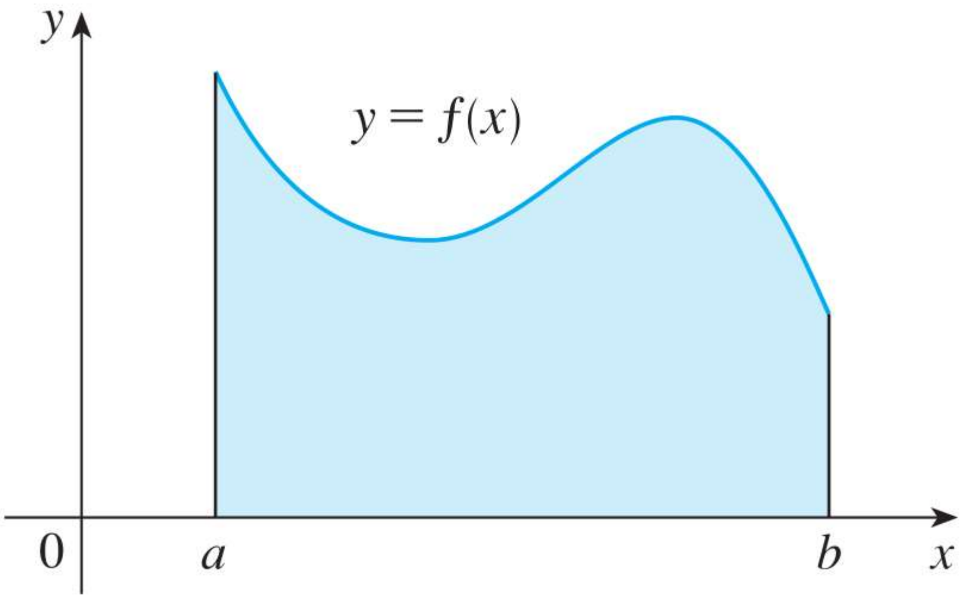

that is,

$$\int_a^b f(x)\ dx = f(c)(b-a)$$

**Geometric Interpretation.** For positive functions $f$, there is a number $c$ such that the rectangle with base $[a, b]$ and height $f(c)$ has the same area as the region under the graph of $f$ from $a$ to $b$.

# 6.6 Work

- Work = Force x Distance.
- If force is a function that changes with respect to distance, then work can be thought of as the area under the curve.

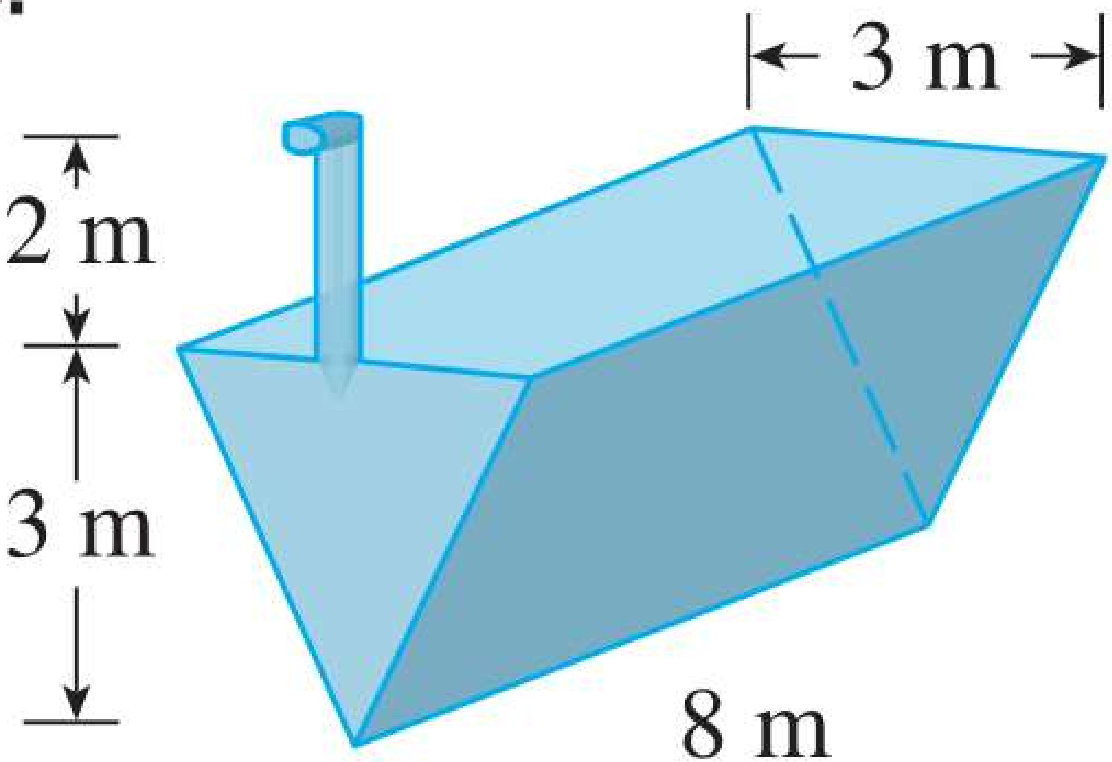



$$W = \int_a^b f(x)\, dx$$

# 6.6 Work

A tank is full of water. Find the work required to pump the water out of the spout.

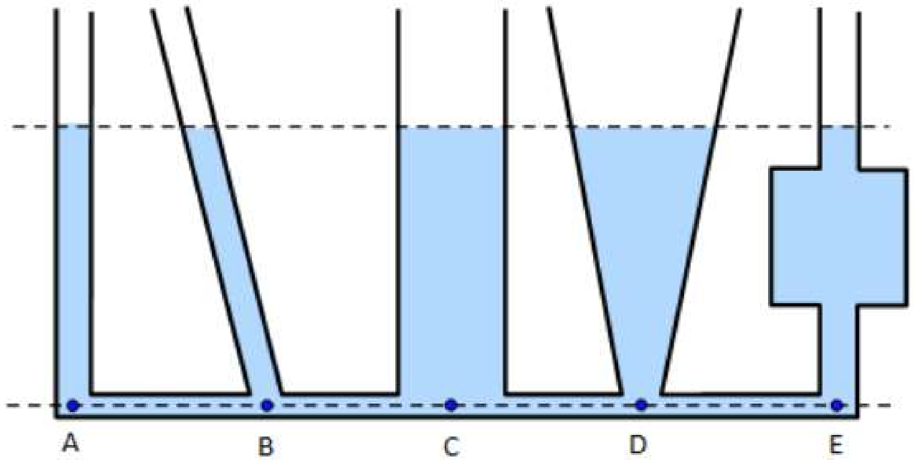
**19.**



# 6.6 Hydrostatic Pressure and Force

At any point in a liquid the pressure is the same in ALL directions. The pressure of a liquid is the same at any given depth below the surface regardless of the shape of the container.

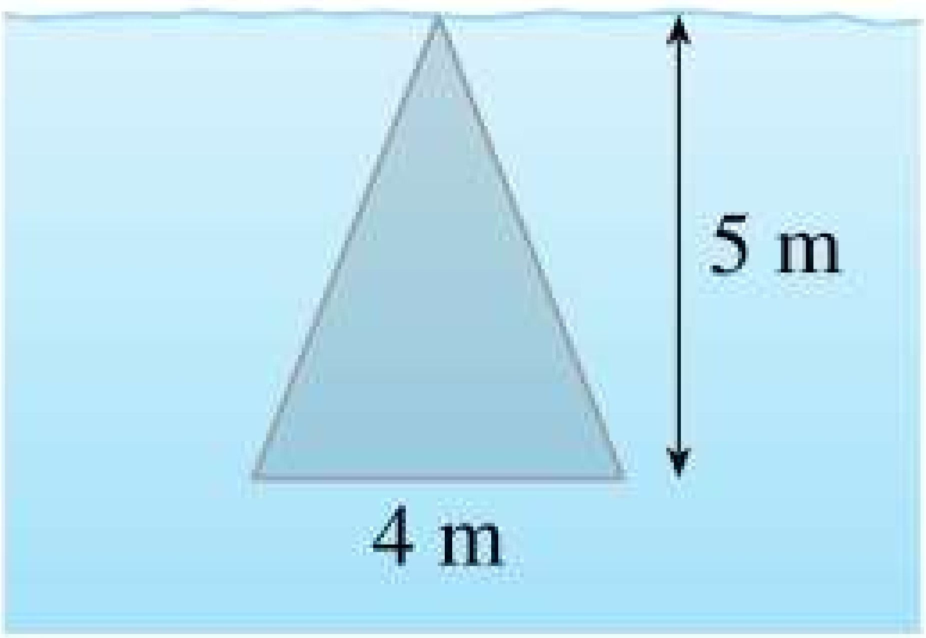
$$P = \frac{F}{A} = \rho g d$$




$\rho$ is the density of water, $g$ is the gravitational constant, and $d$ is the depth of the water.

# 6.6 Hydrostatic Pressure and Force

A triangle with base 4 m and height 5 m is submerged vertically in water so that the tip is even with the surface. Express the hydrostatic force against one side of the plate as an integral.



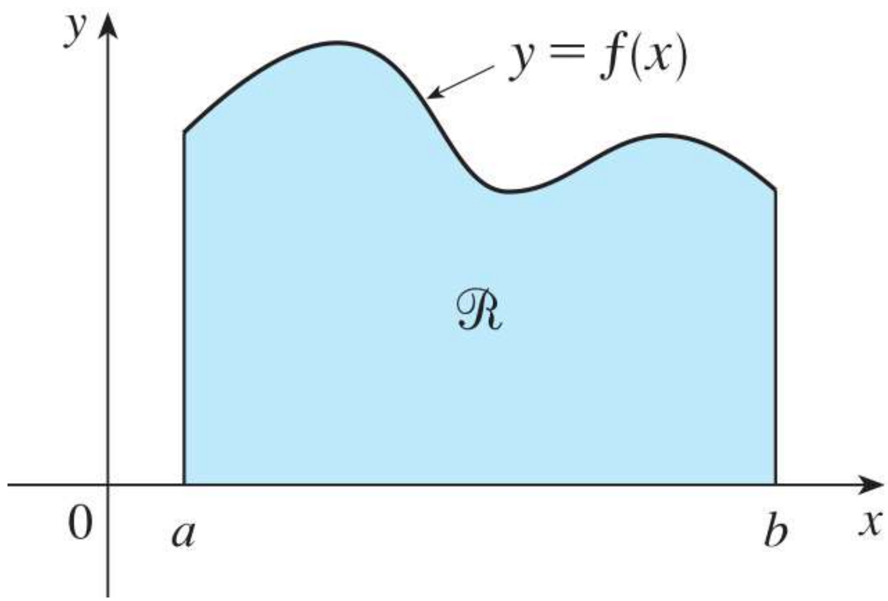
# Center of Mass

The center of mass of a region $\mathscr{R}$ of constant density is located at $(\overline{x}, \overline{y})$ and

$$\overline{x} = \frac{1}{A}\int_a^b x f(x)dx$$

$$\overline{y} = \frac{1}{A}\int_a^b \frac{1}{2}[f(x)]^2 dx$$

where $A = \int_a^b f(x)dx$.



# Computing the Center of Mass

Calculate the center of mass of the given lamina with constant density.