Exam 2 Review Session

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

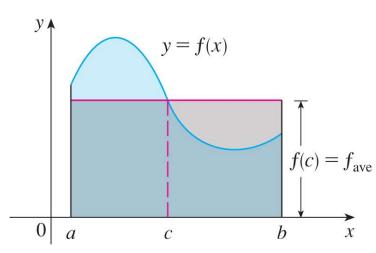
$$f_{\text{avg}} = \frac{1}{b-a} \int_{a}^{b} f(x) \ dx$$

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,

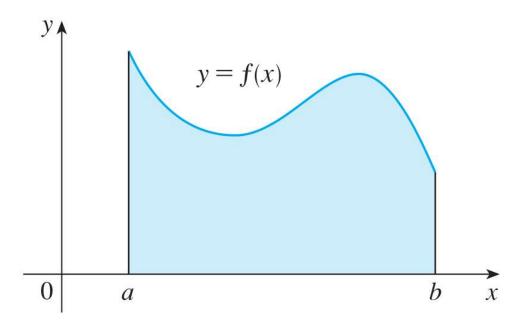
$$\int_{a}^{b} f(x) \ dx = f(c)(b-a)$$



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.



$$W = \int_{a}^{b} f(x) \ dx$$

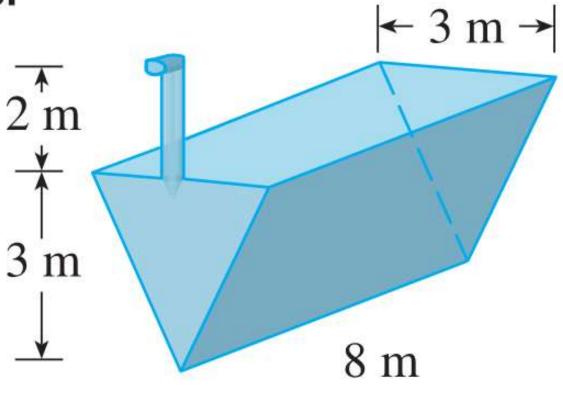
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6.6 Work

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

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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.

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

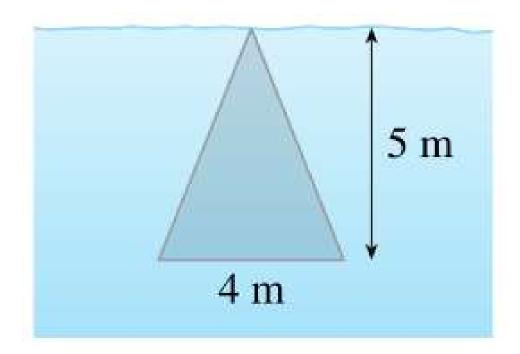
 ρ is the density of water, g is the gravitational constant, and d is the depth of the water.

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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.



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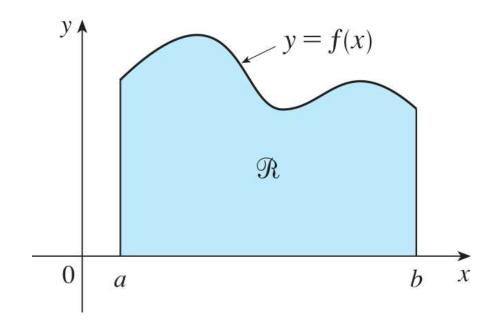
Center of Mass

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

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

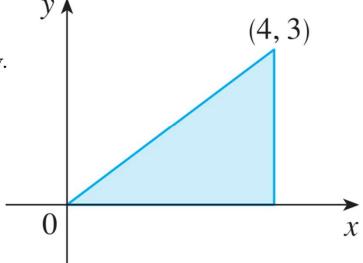
$$\overline{y} = \frac{1}{A} \int_a^b \frac{1}{2} [f(x)]^2 dx$$

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.



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