Today, we will:

- Discuss buoyancy and stability in hydrostatics
- Discuss fluids in rigid-body motion (linear acceleration and solid-body rotation)
- If time, begin Chapter 4 – Fluid Kinematics

E. Hydrostatic Forces on Submerged Surfaces (continued)

3. Buoyancy and Stability

Example: Buoyancy

Given: A sphere of diameter D = 0.0550 m and density ρ_{body} = 1700 kg/m^3 falls into a tank of water (ρ_f = 1000 kg/m^3).

To do: Calculate the net body force on the sphere due to gravity.

Solution:

Stability of a Boat

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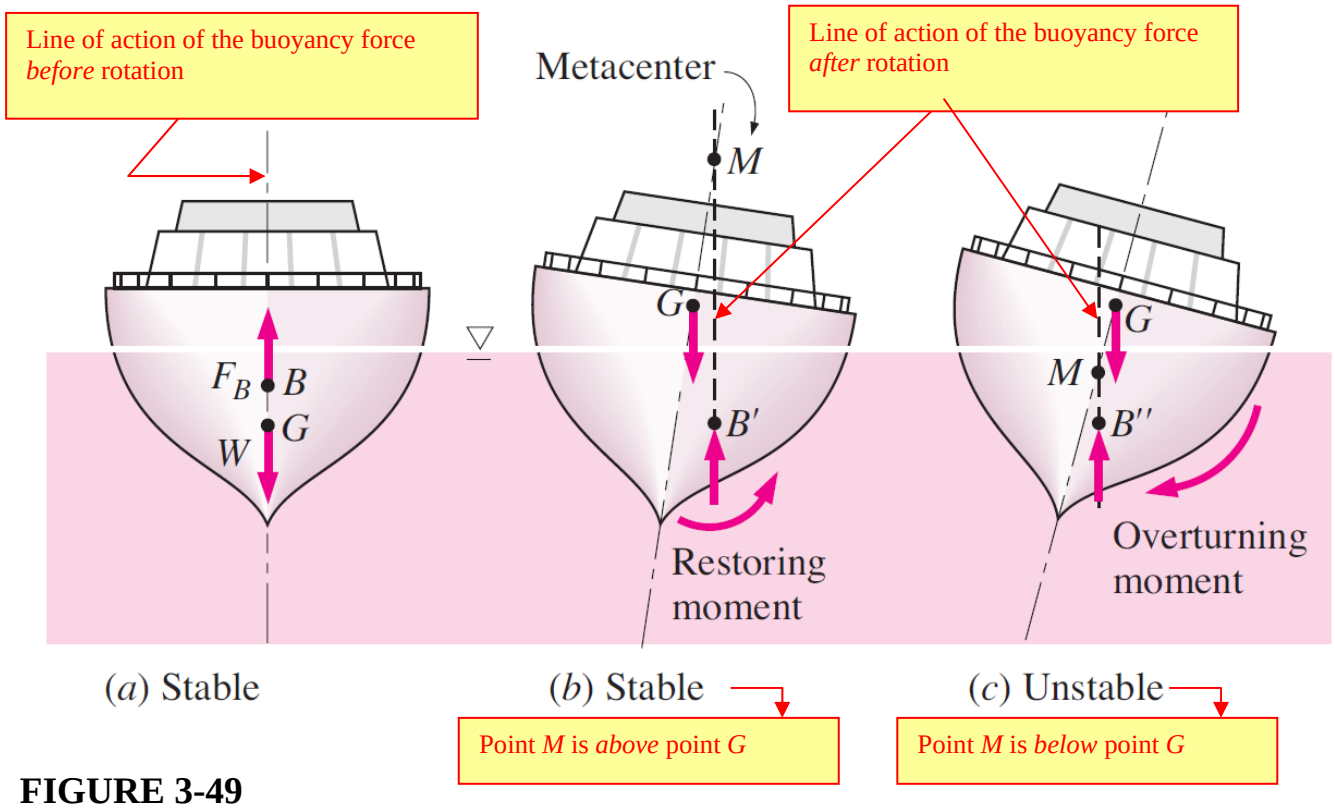

FIGURE 3-49

A floating body is *stable* if the body is bottom-heavy and thus the center of gravity G is below the centroid B of the body, or if the metacenter M is above point G. However, the body is *unstable* if point M is below point G.

M = the **metacenter** = the point where the lines of action of the buoyancy force *before* and *after* rotation intersect