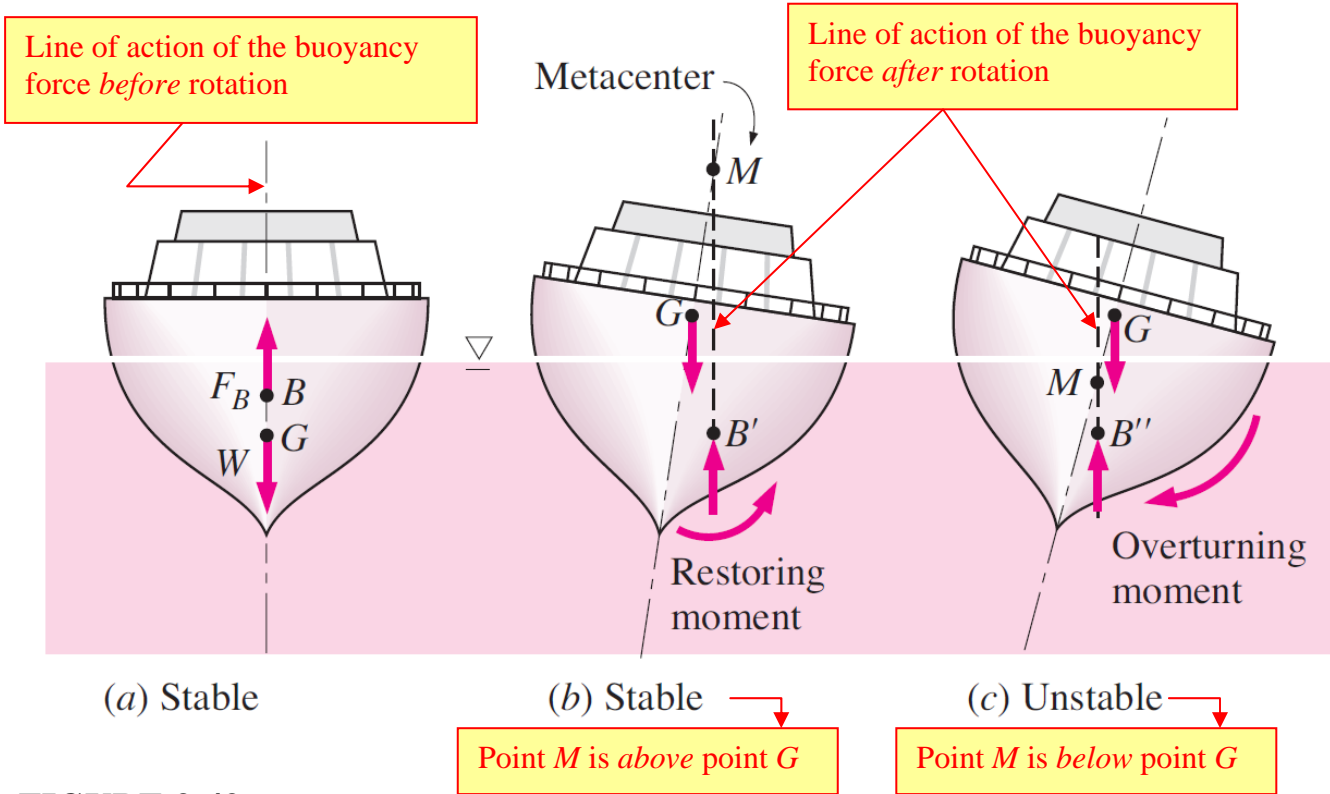# Stability of a Boat

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Line of action of the buoyancy force *before* rotation

Line of action of the buoyancy force *after* rotation

Metacenter

M

F_B B

G

W

G

B'

Restoring moment

M

G

B''

Overturning moment

(*a*) Stable

(*b*) Stable

Point M is *above* point G

(*c*) Unstable

Point M is *below* point G

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