# Problem 3

Relative Motion in 2D Practice Problem

- You are in a boat that is traveling through the water in an area of swift currents. One instrument measures your speed with respect to the water to be 20 ft/s with your boat pointed at a 45 degree angle. GPS however measures your absolute speed and direction to be 25 ft/s at a 55 degree angle. Based on this information, what is the speed and direction of the water current in this area?

25 ft/s

20 ft/s

55°

45°
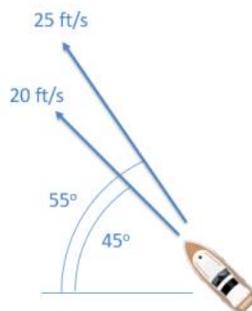
$$\vec{V}_{B/o} = \vec{V}_{B/w} + \vec{V}_{w/o}$$

$$V_{Bx/o} = V_{Bx/w} + V_{wx/o}$$

$$V_{By/o} = V_{By/w} + V_{wy/o}$$

$$-25\cos(55) = -20\cos(45) + V_{wx}$$

$$V_{wx} = -.197 \, ft/s$$

$$25\sin(55) = 20\sin(45) + V_{wy}$$

$$V_{wy} = 6.337 \, ft/s$$

6.337

θ

.197

$$V = \sqrt{6.337^2 + .197^2} = \boxed{6.340 \, ft/s}$$

$$\theta = \tan^{-1}\left(\frac{6.337}{.197}\right) = \boxed{88.2°}$$