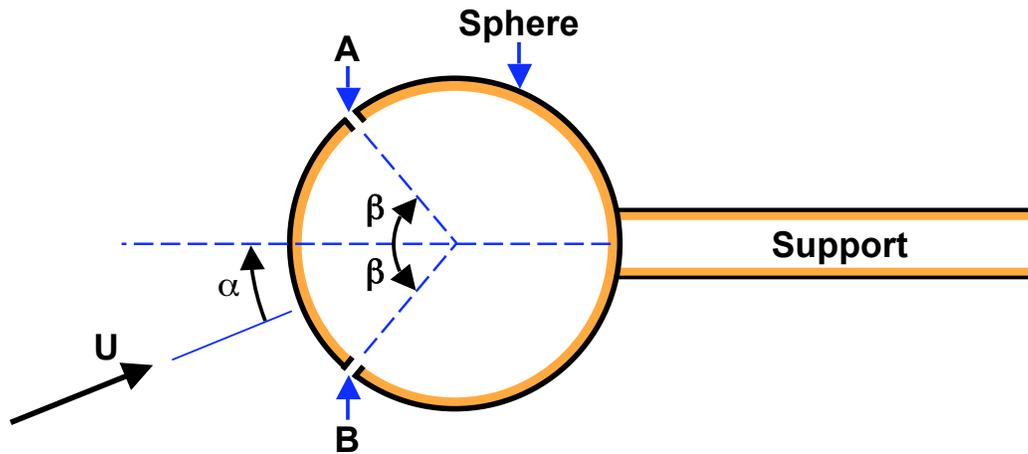


Problem 505A

A yaw probe whose purpose is to determine the direction of a flow consists of a sphere with two pressure taps, A and B, drilled in it at an angle 2β apart:



A manometer or pressure transducer is used to record the difference between the pressures, $(p_A - p_B)$, at these two positions. If the velocity of the oncoming stream, U , and the fluid density, ρ , are known from other measurements, find the relation which should be used to determine the angle, α , of the oncoming stream (in terms of $(p_A - p_B)$, ρ , U and β). [Assume potential flow around the sphere and neglect the effect of gravity.]