
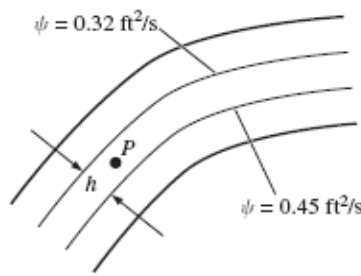
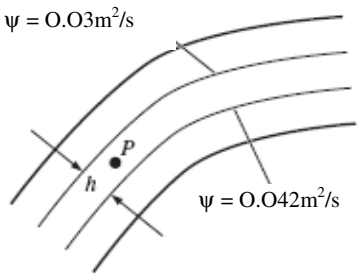

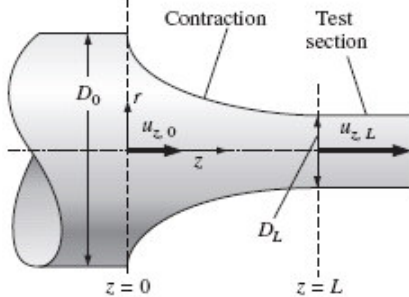
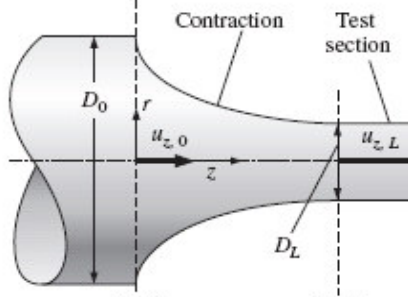


Page No	Current version	Corrected version
457	<p>9-18E Alex is measuring the time-averaged velocity components in a pump using a laser Doppler velocimeter (LDV). Since the laser beams are aligned with the radial and tangential directions of the pump, he measures the u_r and u_θ components of velocity. At $r = 6.20$ in and $\theta = 30.0^\circ$, $u_r = 1.37$ ft/s and $u_\theta = 3.82$ ft/s. Unfortunately, the data analysis program requires input in Cartesian coordinates (x, y) in feet and (u, v) in ft/s. Help Alex transform his data into Cartesian coordinates. Specifically, calculate $x, y, u,$ and v at the given data point.</p>	<p>9-18 Alex is measuring the time-averaged velocity components in a pump using a Laser Doppler velocimeter (LDV). Since the laser beams are aligned with the radial and tangential directions of the pump, he measures the u_r and u_θ components of velocity. At $r = 16\text{cm}$ and $\theta = 30^\circ$, $u_r = 0.42\text{m/s}$ and $u_\theta = 1.16\text{m/s}$. Unfortunately, the data analysis program requires input in Cartesian coordinates (x,y) in meter and (u,v) in m/s. Help Alex transform his data into Cartesian coordinates. Specifically, calculate $x,y,u,$ and v at the given data point.</p>
460	<p>9-42E Consider the Couette flow of Fig. P9-40. For the case in which $V = 10.0$ ft/s and $h = 1.20$ in, plot several streamlines using evenly spaced values of stream function. Are the streamlines themselves equally spaced? Discuss why or why not.</p>	<p>9-42 Consider the Couette flow of Fig. P9-40. For the case in which $V = 3\text{m/s}$ and $h = 3\text{cm}$, plot several streamlines using evenly spaced values of stream function. Are the streamlines themselves equally spaced? Discuss why or why not.</p>
461	<p>9-50E Consider the steady, two-dimensional, incompressible flow field of Prob. 9-33, for which the u velocity component is $u = ax^2 - bxy$, where $a = 0.45$ (ft · s)⁻¹, and $b = 0.75$ (ft · s)⁻¹. Let $v = 0$ for all values of x when $y = 0$ (that is, $v = 0$ along the x-axis). Generate an expression for the stream function and plot some streamlines of the flow. For consistency, set $\psi = 0$ along the x-axis, and plot in the range $0 < x < 3$ ft and $0 < y < 4$ ft.</p>	<p>9-50 Consider the steady, two-dimensional, incompressible flow field of Prob. 9-33, for which the u velocity component is $u = ax^2 - bxy$, where $a = 0.14$ (m.s)⁻¹, and $b = 0.23$ (m.s)⁻¹. Let $v = 0$ for all values of x when $y = 0$ (that is, $v = 0$ along the x-axis). Generate an expression for the stream function and plot some streamlines of the flow. For consistency, set $\psi = 0$ along the x-axis, and plot in the range $0 < x < 0.9\text{m}$ and $0 < y < 1.2\text{m}$.</p>
462	<p>9-62E  Consider the garden hose nozzle of Probs. 9-34 and 9-61. Let the entrance and exit nozzle diameters be 0.50 and 0.14 in, respectively, and let the nozzle length be 2.0 in. The volume flow rate through the nozzle is 2.0 gal/min. (a) Calculate the axial speeds (ft/s) at the nozzle entrance and at the nozzle exit. (b) Plot several streamlines in the rz-plane inside the nozzle, and design the appropriate nozzle shape.</p>	<p>9-62 Consider the garden hose nozzle of Probs. 9-34 and 9-61. Let the entrance and exit nozzle diameters be 1.25cm and 4cm, respectively, and let the nozzle length be 5cm. The volume flow rate through the nozzle is 7.5L/min. (a) Calculate the axial speeds (m/s) at the nozzle entrance and at the nozzle, and design the appropriate nozzle shape.</p>

462	<p>9-66E A sketch of flow streamlines (contours of constant stream function) is shown in Fig. P9-66E for steady, incompressible, two-dimensional flow of air in a curved duct. (a) Draw arrows on the streamlines to indicate the direction of flow. (b) If $h = 2.0$ in, what is the approximate speed of the air at point P? (c) Repeat part (b) if the fluid were water instead of air. Discuss. Answers: (b) 0.78 ft/s, (c) 0.78 ft/s</p>	<p>9-66 A sketch of flow streamlines (contours of constant stream function) as shown in Fig. P9-66 for steady, incompressible, two-dimensional flow of air in a curved duct. (a) Draw arrows on the streamlines to indicate the direction of flow. (b) If $h = 5$ cm, what is the approximate speed of the air at point P? (c) Repeat part (b) if the fluid were water instead of air. Discuss.</p>
462	 <p>FIGURE P9-66E</p>	 <p>FIGURE P9-66</p>
468	<p>9-115E  A group of students is designing a small, round (axisymmetric), low-speed wind tunnel for their senior design project (Fig. P9-115E). Their design calls for the axial component of velocity to increase linearly in the contraction section from $u_{z,0}$ to $u_{z,L}$. The air speed through the test section is to be $u_{z,L} = 120$ ft/s. The length of the contraction is $L = 3.0$ ft, and the entrance and exit diameters of the contraction are $D_0 = 5.0$ ft and $D_L = 1.5$ ft, respectively. The air is at standard temperature and pressure. (a) Verify that the flow can be approximated as incompressible. (b) Generate an expression for the <i>radial</i> velocity component u_r between $z = 0$ and $z = L$, staying in variable form.</p>	<p>9-115 A group of students is designing a small, round (axisymmetric), low-speed wind tunnel for their senior design project (Fig. P9-115). Their design calls for the axial component of velocity to increase linearly in the contraction section from $u_{z,0}$ to $u_{z,L}$. The air speed through the test section is to be $u_{z,L} = 36.5$ m/s. The length of the contraction is $L = 0.9$ m, and the entrance and exit diameters of the contraction are $D_0 = 1.5$ m and $D_L = 0.45$ m, respectively. The air is at standard temperature and pressure. (a) Verify that the flow can be approximated as incompressible. (b) Generate an expression for the <i>radial</i> velocity component u_r between $z = 0$ and $z = L$, staying in variable form.</p>
468	 <p>FIGURE P9-115E</p>	 <p>FIGURE P9-115</p>

