**Chemical Engineering 150A First Midterm Review Sheet**

**Fluid statics**

2 points connected in same fluid at the same height, pressure is equal

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|  |  |

**Compressible fluid**

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**Momentum Balance**

**Straight tube**:

**U tube**:

**Velocity entering the fitting**- push the fitting in the direction of velocity

**Velocity leaving the fitting**- push the fitting in the opposite direction of velocity

**Energy Balance**

|  |  |
| --- | --- |
| Turbulent flow |  |
| Laminar flow |  |

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| --- | --- | --- |
| Terms | + | - |
|  | Work done on the system | Work done by the system |
|  | Inlet > outlet, start with high pressure | Inlet < outlet, end with high pressure |
|  | Start with high velocity, decelerating | Turn into high velocity, accelerating |
|  | Start at higher point, going into low point | Start with low point, elevation is raised |
|  | Always **positive**, work is dissipated as friction |

|  |  |  |
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|  | **Laminar** | **Turbulent** |
| **Newtonian** |  | Churchill’s correlation (more accurate)Colebrook equation (easier) |



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| **Power law fluid** |
|  |  |
| **Laminar** |  |
| **Turbulent** | PLf_turb |

L is the length of the tube

D is the diameter of the tube

µ is the viscosity of the fluid

k is the roughness factor

|  |  |
| --- | --- |
| **Bingham Plastic** |  |
| **Laminar** |  |
| **Turbulent** | BP_f |

Flow through non-circular conduits

RH = hydraulic radius

S = cross-sectional area

Lp = wetted perimeter

Conversion