Prerequisite Quiz 02

Name: _____

Question:	1	2	3	4	5	Total
Points:	10	10	10	10	10	50
Score:						

University of Wisconsin - Madison

For multiple choice questions, circle your answer. For short answer, please be
concise. Try to keep your answers in the space provided. If you run out of
room for an answer, continue on the back of the page.

[10]   1. Given a differential control volume, Ω, with a spatially and temporally varying source
of energy, $\dot{q}'''$, derive an evolution equation for the time rate of change of the
temperature within the control volume. Use an integral approach to do this. Please be
explicit and explain what is occurring during each step of the derivation.

[10]   2.   Given a slab of thickness a with a spatially varying energy source, $\dot{q}'''(x)$, solve the steady state heat equation subject to a constant temperature on the left face of the slab and an insulated right face.

[10] 3. Given a cylinder of radius a with a constant energy source, $\dot{q}'''$, solve the steady state heat equation subject to a convective boundary condition on the outer face of the cylinder. The heat transfer coefficient is h and the bulk temperature of the ambient fluid is T_∞.

[10] 4. Describe the physical meaning of the following dimensionless variables and give their definitions in terms of physical variables: Nu, Re, Bi, f, and Pr.

[10]   5. Explain the Reynolds Analogy. Points will be allocated based upon the level of detail and understanding demonstrated.