

**BAE 103**  
**Energy in Biological Systems**

**Problem Set No. 3**  
**Concepts of Work, Power and Energy**  
**Due Date: Wednesday, January 24**

- 3.1 Water from a well is provided to replacement dairy heifers on pasture. There are a total of 60 cows in the herd. Assume each cow consumes 42.0 gallons of water per day. How many gallons of water must be pumped per day to meet the needs of these cows?
- 3.2 The well that supplies water to the stock tank is 450 feet deep (depth from soil surface to water level in well). Assume the pump is to run no more than three hour per day to pump enough water to meet the needs of the cows on pasture in problem 3.1 above. What pumping capacity is needed to meet this requirement (liters/minute)?
- 3.3 Estimate the power requirement (kW) to drive the pump in problem 3.2 above.
- 3.4 An electric motor is used to power the pump. When operating at 110 Volts AC, the motor draws 12.3 Amps of current. What the overall efficiency (expressed as %) of the pump and motor combination?