

BAE 103
Energy in Biological SystemsProblem Set No. 4
Concepts of Power, Energy, and Thermal Efficiency
Due Date: Wednesday, January 1

- 4.1 The thermal efficiency of a diesel engine is a function of the “compression ratio” (r) and the fuel “cutoff ratio” (c). The equation describing relationship is as follows,

$$e = 1 - \frac{1}{r^{k-1}} \left[\frac{c^k - 1}{kc - 1} \right]$$

where e is the thermal efficiency, k is a ratio of the specific heats of air (constant pressure to constant volume), and c is the “cutoff ratio.” Using Excel, develop a plot of thermal efficiency versus compression ratio. Fix the “cutoff ratio” (c) at 0.10 and use a value of 1.3 for k . Vary the compression ratio (r) between 10.0 and 25.0 in increments of 0.5. Be certain to label both axes and include units, provide a title for your graph, and ***include your name in the sub-title to the graph.*** Submit the graph in hard copy form -- this is the only submission requirement for this homework assignment.