PHYS-310   Demographics, Heat Transfer, Heat Engines, Problem Set #2. Due Friday 4/12

1) Please go to: http://www.animatedengines.com/ and pick out at least 4 engines that interest you and watch the apps for each. Please identify how and where WE put work into the gas, and then add heat and then the gas does work FOR us that we get out. Also be aware of why the work we get out is more than the work we put in.

2) Go to Gapminder.org, and click on "Try our new tools" at the top of the webpage. Explore demographics of the world's people. Pay particular attention to the country of your community of interest. How did the things you're looking at develop over time? Take at least two screen shots to discuss with your colleagues.

3)   Coal Power Production
Coal and natural gas are the two predominant forms of fossil fuels used for generating electricity in the world. Compared to the NGCC, coal is a worse polluter on two levels – criteria pollutants (like toxins), and in terms of CO_2 production.
   a) What does NGCC stand for?
   b) Why does burning coal emit more toxins into the atmosphere and what are some of these toxins?
   c) For the same amount of electricity, coal emits more CO_2 than the most efficient Natural Gas electricity generation by what factor?
   d) Why is it that Coal Electricity emits more CO_2 than natural gas electricity generation? Please give two reasons.
   e) What portion of the world's coal does the US consume? China? What portion of the world's NG does the US consume? China?

4)   Guessing Energy: Please do this question in two parts:
   a) What do you think requires more energy: you riding fast on your bicycle, or a hot cup of coffee? By what factor do you think they vary: That is $E_{bike} \sim$ ____ E_{coffee}
   b) Please do the calculations and see which has more energy.

5) I make a house out of adobe, (mud, cob, earth whatever you like to call it). The walls are 3m high, 4m wide, and is 50 cm thick. Assume that the roof is really well insulated, so no heat escapes from it. It is 70 °F inside and 30 °F outside.
a) How much power do I need to dissipate in the room to keep the temperature constant?
b) I put a window in one wall. It is 2m wide and 1m high. It's single paned, perfectly transparent glass of thickness 2 mm. Estimate the house's heat loss with the window.