Problems of the Week 1

Always show your work to receive credit (NO WORK=NO CREDIT)

1. **Modeling Problem**- Crude oil comes from the Earth's (radius ≈6400km) crust, which is 40km thick. Assuming that the entire crust of the Earth is filled with oil, estimate how long will the oil last assuming the rate of consumption increases by 3% per year. The present daily rate of consumption is 80 million barrels per day worldwide (1 barrel-42 gallons). You can use the 70-rule for growth for your estimate or the expression for growth compounded in discrete intervals or set up an Excel spreadsheet (**you are not allowed to use the equations for continuous and discrete growth from your calculus text**).
   A. $4x10^9$ years B. $7x10^6$ years C. $4x10^4$ years
   D. $8x10^2$ years E. $5x10^1$ years

   Just for fun see how your answer changes when you vary the rate of growth in consumption. Between 1880 and 1970 (http://www.hubbertpeak.com/hubbert/print.htm) the rate of growth in oil was 7% per year. It is much lower now.

   70-rule: the time for a quantity to double, given a growth rate is 70/rate. Example, if you have $500 in a savings account accruing interest at 5% per year, then it would take 70/5=14 years to double the principle.

2. An object moves with an acceleration $a=3.0x10^2-7.5x10^2t$, where **a** is measured in cm/s^2. Assuming that the initial velocity and position of the object are $\mathbf{v}(t=0)=-6.0x10^1$cm/s and **x**(t=0)= 8.0cm,what is the velocity of the object when x=0?
   A. –350cm/s B. -25cm/s C. 0cm/s D. 150cm/s E. 750cm/s