HW #3
Due Friday Sept. 19

Chapter 4: 48P, 58E + N3 & N24


11) A particle in molasses or some other viscous fluid experiences an acceleration (in addition to gravity) that opposes its velocity: \( \mathbf{a} = -\gamma \mathbf{v} - \mathbf{g} \). Suppose the particle has initial velocity \( \mathbf{v}_0 \). Find its velocity as a function of time \( t \). What is its limiting speed?

12) A particle experiences an acceleration \( a(x) = -\omega_0^2 x \). If the particle starts at the origin with velocity \( v_0 \hat{i} \), find its subsequent velocity as a function of position.

13) Marco Pantani climbed the famed 13.8 km l’Alpe d’Huez route in a record 37'35". What was his average speed? Suppose he rides down the mountain at a pace of 75 km/hr. What would his average speed be for the round trip? Why isn’t it the average of the upward and downward going speeds? Now calculate his average climbing inverse speed (min/km) and his round trip inverse speed. Show in general that the round trip average inverse speed is the average of the upward and downward inverse speeds:

\[
\frac{1}{v_{av}} = \frac{1}{2} \left( \frac{1}{v_{up}} + \frac{1}{v_{down}} \right)
\]