FIRST MIDTERM

Name (print)  Aposbol Gramada  Name (signed)  

Discussion instructor (circle): Gramada Hansen Li Rex Zhukov

Discussion Section #  

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

(a) Convert 210 km/hr to ft/s.
   \[
   210 \text{ km/hr} = 210 \times 1000 \times 3.28 \div 3600 \text{ ft/s} = 1.91 \times 10^2 \text{ ft/s} 
   \]

(b) Convert 125 ft/s to m/s.
   \[
   125 \text{ ft/s} = 125 \times 0.3048 \text{ m/s} = 38.1 \text{ m/s} 
   \]

(c) On a very small planet an object falls 150 m from rest in 145 s. Calculate \(g\) on this planet.
   \[
   x = gt^2 \quad \Rightarrow \quad g = 2x/t^2 = 2 \times 150 \div (145)^2 = 1.43 \times 10^{-2} \text{ m/s}^2 
   \]
   or \(1.42 \times 10^{-2} \text{ m/s}^2\)

(d) A jet aircraft must accelerate from rest to takeoff speed while traveling 10,000 ft. If the minimum takeoff speed is 135 mi/hr (198 ft/s), calculate the average acceleration needed in ft/s².
   \[
   v^2 = 2ax \quad \Rightarrow \quad a = v^2/2x = (198)^2/2 \times 10^4 = 1.96 \text{ ft/s}^2 
   \]
   or \(1.960 \text{ ft/s}^2\)

(e) On an icy day the maximum braking acceleration (deceleration) of a car might be as small as 5.00 ft/s² in magnitude. Calculate the distance needed to stop a car going at 40 mi/hr with this deceleration.
   \[
   40 \text{ mi/hr} = 40 \times 5280 \div 3600 = 5.867 \times 10 \text{ ft/s} 
   \]
   \[
   v^2 = v_o^2 - 2ax \quad \Rightarrow \quad x = \frac{v_o^2}{2a} = \frac{(5.867 \times 10)^2}{2 \times 5.00} = 3.44 \times 10^2 \text{ ft} 
   \]