Problem Set 1
Physics, summer 2020/21

1) **(1p.)** Earth is approximately a sphere of radius 6.37×10^6 m. What are (a) its circumference in kilometers, (b) its surface area in square centimeters, and (c) its volume in cubic meters?
2) **(2p.)** Compute your average velocity in the following two cases:
    a. You walk 73.2 m at a speed of 1.22 m/s and then run 73.2 m at a speed of 3.05 m/s along a straight track.
    b. You walk for 1.00 min at a speed of 1.22 m/s and then run for 1.00 min at 3.05 m/s along a straight track.

    Graph x versus t for both cases and indicate how the average velocity is found on the graph.
3) **(3p.)** From the top of a building of height h = 100m I throw a stone up with velocity 10m/s. What is the maximum height it reaches and when is that? How many seconds does it spend on its way down between h = 50m and h = 0m? What is its velocity when h = 50m? If when it is airborne I quickly dig a hole 50 m deep, when and with what speed will it hit the bottom?
4) **(4p.)** Romeo is at x = 0 at t = 0 when he sees Juliet at x = 6m.
    a. He begins to run towards her at v = 5m/s. She in turn begins to accelerate towards him at $a = -2\text{m/s}^2$. When and where will they cross? Sketch their motions measuring time horizontally and position vertically.
    b. Suppose instead she moved away from him with positive acceleration a. Find a_{max}, the maximum a for which he will ever catch up with her. For this case find the time t of their contact. Show that for smaller values of a these star crossed lovers will cross twice. Draw a sketch for this case. Explain in words why they cross twice.

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1.03.2021r.