Analytical Physics I

Guidelines for Written Assignments

Dr. Pogo, Fall 2004

Examples of the minimum work necessary are provided on the back of this sheet.

1) Use 8½ × 11 inch paper only (no spiral ring paper!), and use only 1 side.
2) Put your name on the top of *every* page. Also, put the course name and the assignment number (e.g., "Analyt I, HW #4") at the top of the first page.
3) Make sure that each problem is clearly indicated (i.e., let me know that it is problem 3-1 that you're doing there, or whatever it is).
4) Staple (*don't paperclip!*) your pages together. Do **not** mutilate the pages in an attempt to get them to stay together; that is worse than having nothing.
5) Show work in a clear and logical fashion – solutions should progress as I read *down* the page, not up, not sideways, not around the edges. Draw pictures (make them *large*) when necessary.
6) **Whenever possible, problems should be done entirely symbolically.** You will rarely be given any numeric values for variables used in written assignments. Examples of symbols include: m, g, p, V_0, 1, and ½. *Define* your symbols when necessary for clarity. See the second problem on the reverse side of this sheet.
7) You don't have to show all of your algebra (I really don't want to see it), but you do have to show all of the fundamental ideas (using both **words** and **symbols**). *Every* problem solution should have sentences! **Warning**: failure to completely follow these directions has a 100% chance of negatively affecting your grade. For written assignments, **the method counts more than the answer**!!
8) Ensure that your answers have sensible units. For example, if m = 10kg, then it is logically impossible for your answer to include (m + 1) anywhere, since "1" doesn't have units of mass. If your answer happens to include numeric values, ensure that you don't have a ridiculous number of sig-figs.
9) Circle or box the final answer. Use units with the answer.

Wrong answer:	$\boxed{19.2145}$		
Wrong answer:	$\boxed{19.2\text{ kg}}$		
Good numeric answer:	$\boxed{m_{rocket} = 19.2\text{ kg}}$		
Good symbolic answer:	$\boxed{a_1 = g(m_1+m_2)/m_1}$	or	$\boxed{m_{\max} = \frac{1}{4}p}$

   Notice that symbolic answers may not have units, since each symbol stands for both a number and the appropriate units.
10) Be neat. You must use pencil, not pen. Use an eraser to remove errors.
11) You may discuss ideas with classmates, but you may not copy or use any part of another student's work.

Note: You are NOT required to type your solutions! You should write them by hand (neatly).
Problems are from Halliday, Resnick, and Walker (6^{th} edition).

1-22P

given: rainwater: r = 1000 kg/m^3 (density)
thunderstorm: t = 30 min (time of storm)
A = 26 km^2 (size of town)
h = 2 in (amount of rainfall)

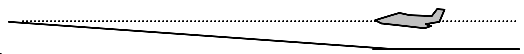
Finding the mass of rainwater:

$$m = rV = rhA = \left(1000\ \text{kg/m}^3\right)\left(2\ \text{in}\right)\left(26\ \text{km}^2\right)\times\frac{2.54\ \text{cm}}{1\ \text{in}}\times\frac{1\ \text{m}}{100\ \text{cm}}\times\frac{1000\ \text{m}}{1\ \text{km}}\times\frac{1000\ \text{m}}{1\ \text{km}}$$

$$\boxed{m_{\text{rainwater}} = 1.32\times10^9\ \text{kg}}$$

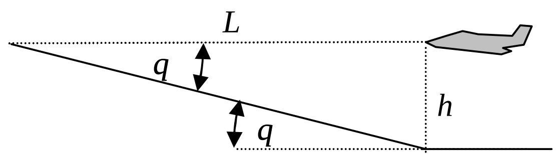
- We didn't need to use the information about the time of the storm.
- In English units, this short storm dropped one and a half *million tons* of water on the town.

2-4P The slope is drawn to scale in the first sketch. However, since this angle is so small, I am redrawing it to make the relevant features more visible:



to scale

given: h = 35 m
q = 4.3°
$$v = 1300\frac{\text{km}}{\text{h}}\times\frac{1\ \text{h}}{3600\ \text{s}}\times\frac{1000\ \text{m}}{1\ \text{km}} = 361.1\ \text{m/s}$$



First, find the distance to the hill at that altitude:

$$\tan q = \frac{h}{L} \rightarrow L = h/\tan q\ .$$

Next, we relate distance and speed to time: $v = L/t$ → $t = \dfrac{L}{v} =$ $\boxed{t = \dfrac{h}{v\tan q}}$

Plugging in values, we find that $\boxed{t_{\text{collision}} = 1.29\ \text{s}}$

- This is just over one second, which is not very much time!

3-17E Given: $\vec{a} = (4.0\text{m})\hat{i} + (–3.0\text{m})\hat{j} + (1.0\text{m})\hat{k}$
$\vec{b} = (–1.0\text{m})\hat{i} + (1.0\text{m})\hat{j} + (4.0\text{m})\hat{k}$

a) $\vec{a}+\vec{b} = (4.0\text{m}–1.0\text{m})\hat{i} + (–3.0\text{m}+1.0\text{m})\hat{j} + (1.0\text{m}+4.0\text{m})\hat{k}$

$$\boxed{\vec{a}+\vec{b} = (3.0\text{m})\hat{i} + (–2.0\text{m})\hat{j} + (5.0\text{m})\hat{k}}$$

b) $\vec{a}-\vec{b} = (4.0\text{m} – (–1.0\text{m}))\hat{i} + (–3.0\text{m}–1.0\text{m})\hat{j} + (1.0\text{m}–4.0\text{m})\hat{k}$

$$\boxed{\vec{a}-\vec{b} = (5.0\text{m})\hat{i} + (–4.0\text{m})\hat{j} + (–3.0\text{m})\hat{k}}$$

c) $\vec{a}-\vec{b}+\vec{c} = 0 \rightarrow \vec{c} = \vec{b}-\vec{a} = –(\vec{a}-\vec{b})$. Since we just found ($\vec{a}-\vec{b}$) above, then:

$$\boxed{\vec{c} = (–5.0\text{m})\hat{i} + (+4.0\text{m})\hat{j} + (+3.0\text{m})\hat{k}}$$