Physics 1308-H01 Exam #1, Fall, 2010

Instructions: Do real good. Show your work for all problems. Partial credit will be assigned for things that make sense. $g=9.80\ m/s^2$.

Short questions: (7.5 points each, drop the low one)

1. The sum 512.123 + 22.11 has how many significant figures?
a) 6 b) 5 c) 4 d) 3 e) 2

2. A furlong is a unit of length equal to 201 m, while a fortnight is equal to 14 days or 1.21×10^6 s. 2000 furlongs/fortnight is what speed in m/s?

$$\left(2000 \frac{Fu}{Fo}\right)\left(201 \frac{m}{Fu}\right)\left(\frac{1}{1.21\times10^6} \frac{Fo}{s}\right) = 0.33\ m/s$$

3. A body is thrown straight up with some initial speed. Describe how its velocity and acceleration vary as it undergoes its subsequent motion.

$\vec{v}$ is positive but decreasing as it goes up, reaches 0 at peak, becomes negative with increasing magnitude as it drops. $\vec{a} = -g\hat{j}$ throughout.

4. A particle which moves on the x axis has a position given by $x = 9.0\ m - (3.0\ m/s)t + (1.8\ m/s^2)t^2$. At what time or times is its velocity zero?

$$V = -3.0\ m/s + (3.6\ m/s^2)t = 0$$
$$t = \frac{3.0\ m/s}{3.6\ m/s^2} = 0.83\ s$$

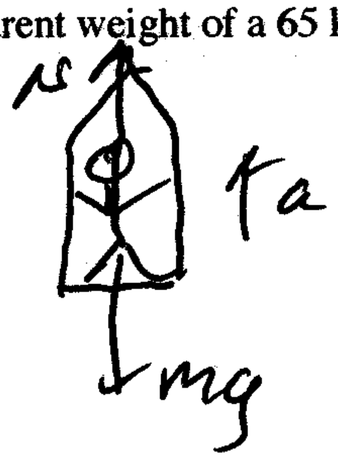
5. We have two vectors, $\vec{A} = 3.0\hat{i} + 2.0\hat{j}$ and $\vec{B} = 1.5\hat{i} - 5.0\hat{j}$. What is the MAGNITUDE of the vector $\vec{C} = \vec{A} - 2\vec{B}$?

$$\vec{C} = (3.0 - (2\times(1.5)))\hat{i} + (2.0 - (2(-5.0)))\hat{j}$$
$$= 0\hat{i} + 12\hat{j}$$
$$|\vec{C}| = 12$$

6. I throw a ball horizontally off of a cliff at a speed of 20 m/s. After it has traveled 45 m horizontally, how much has it dropped vertically?

$$t = \frac{45\ m}{20\ m/s} = 2.25\ s$$
$$y - y_0 = -\tfrac{1}{2}gt^2 = -25\ m$$

7. Find the apparent weight of a 65 kg person in a rocket which is accelerating upwards at an acceleration of $14.0\ m/s^2$.



$$N - mg = ma$$
$$N = m(g+a) = 1550\ N$$