Physics 200 **Problem set #1**

Daydreaming?

The Green Sarge is on a leisurely hike across Antarctica. After a few hundred miles of ice fields, he spots a Beige installation nestled between sheer ice cliffs. He postpones his pleasant stroll for the sake of humanity, and prepares to assault the evil base.

1. The base is 20 furlongs north and 10 furlongs west of the Sarge's current position. Unfortunately, he's got to adjust the 80 mm cannon on his Swiss Army Knife to SI units.

a) How far away is the base in SI units?

As he's setting up his cannon, Sarge realizes that the explosives will hit the ice cliff, not the base. Sarge spots a better vantage, grabs the cannon, and jogs 2 statute leagues north.

b) How far away from the base is he now?

2. During his invigorating jog to the new attack position, Sarge reads a few of the marks on the cannon. He finds a little 'Suggested Price' sticker that has both Euro and US dollar values: 30 Euros or 40 US dollars. He also finds some smaller print about the shell size being different. According to the tag, the EU version launches a cylinder 60 mm in diameter, 15 cm in length. The US version launches 2-inch diameter, 6 inch-long shells.

a) Do you get more explosives for your money from the US or the EU version?

3. Sarge fires off a few rounds until he hits the Beige base's secret Antarctic-deep-borehole-mine, and magma spews out. Hot magma vaporizes the Beige base. Sarge runs at full speed, but before he makes it to his ship, the Antarctic ice melts away into the ocean.

a) By what amount does this cause the world's oceans to rise? This is an estimation problem. Do not look up information to complete it. Show your steps and process.

4. Sarge now has to swim for land. He makes a few estimates in his head and swims north for 400 miles, then northwest (45 degrees from north) for 600 miles. Spying sea birds, he then heads 60 degrees west of north for 200 miles, until he finally reaches shore.

a) How far, magnitude and direction, is he from his original location (assume a flat earth)?