1a. Use an appropriate linear approximation to estimate the value of $\sqrt[3]{8.3}$. Is your estimate too high or two low? Justify your assertion without computuing the actual value. Then compute the actual value and compare it with your estimate.

b. Use an appropriate linear approximation to estimate the value of $\sin 1°$. Is your estimate too high or two low? Justify your assertion without computuing the actual value. Then compute the actual value and compare it with your estimate.

2. The height (in feet) of a balloon m minutes past noon is given by the function $H(m)$. Suppose that $H(3) = 500$ and $H'(m) = 10\sqrt{16 + m^2}$. Estimate the height of the balloon at time $t = 3.1$ minutes. Is your estimate too high or too low? Justify your assertion.

3a. You measure the side length of a cube with an error of at most $\pm p\%$. Estimate the maximum percent error in computing the volume of the cube.

b. You measure the side length of a cube of copper with an error of at most $\pm p\%$. If the mass of the copper is 100 grams, estimate the maximum percent error in computing the density of the sample.

4. You measure the circumference of a sphere (around an equator) with an error of at most $\pm p\%$. You then use your measurement to compute the surface area of the sphere. Estimate the maximum percent error in your computation.

5. Boyle's law states that when a sample of gas is compressed at a constant temperature, the product of the pressure and volume remains constant: $PV = C$. Suppose that for a sample of hydrogen, we have $PV = 24$, where the pressure P is measured in atmospheres, and the volume V is measured in liters. Estimate the volume of the sample when the pressure is 1.9 atmospheres. You should be able to do this problem without your calculator.

6. Between 0°C and 30°C, the volume V in cubic centimeters of one kilogram of water at a temperature T is given approximately by the formula

$$T = 999.87 - .06426T + .0085043T^2 - .0000679T^3$$

Estimate the density of water at a temperature of $1°C$. You should be able to do this calculation without your calculator.