Math 4452: Math Modeling Assignment 1 Due: Jan 29 2002

(20) 1. In physics and chemistry labs we are used to estimating the error which is introduced into our experimental results via the propagation of experimental error through the equations we use. For example, if you measure $\alpha \pm \Delta\alpha$ and $x \pm \Delta x$, then then the error in $y = f(\alpha, x)$ is given by

$$\Delta y = \frac{\partial f(\alpha, x)}{\partial \alpha} \Delta\alpha + \frac{\partial f(\alpha, x)}{\partial x} \Delta x.$$

The sensitivity of x_c to α, $S(x_c, \alpha)$, where x_c is the value of x which optimizes y is given by

$$S(x_c, \alpha) = \frac{dx_c}{d\alpha} \cdot \frac{\alpha}{x_c}.$$

Is there a relationship between these two concepts? Discuss them and how they are similar and how they are different.

(40) 2. Problem 1.4.9 from the text.

(40) 3. Problem 2.4.7 from the text.