

NAME _____

1. The first column in the table below contains the best estimate of an experimental quantity. The second column is the uncertainty at the 95% confidence level. The third column lists the units for the first two columns. For each row in the table, write down the result and its uncertainty in “presentation form”. The first row has been completed for you. [There may be more than one reasonable way of presenting the final value. You only need to write down one acceptable form.]

Quantity	Uncertainty	Units	Presentation Form
37,228.3902	40.3019	cm ⁻¹	37,230 ± 40 cm ⁻¹
37,228.39020	0.001923198	cm ⁻¹	
2904.8	468.8	s	
7.2439 × 10 ⁻⁷	1.4041 × 10 ⁻¹⁰	Pa	
-13.924	27.904	m s ⁻¹	
6.2670 × 10 ¹⁸	9.644 × 10 ¹⁶	g	

2. You want to model your xy-data using the fitting function,

$$y = 16ax + \frac{2b}{\sin x} + c(x-1)^2$$

where a , b , and c are fitting parameters whose values are to be determined

(a) List the basis functions that you would enter in the least-squares fitting template (LINFIT), i.e. indicate what expression goes in each placeholder below:

F(x) :=

(b) The parameter vector obtained for your fit using the basis functions in (a) is shown below. List the values of a , b , and c .

$$p = \begin{bmatrix} 7.10353 \\ -8.33673 \\ 3.3529 \end{bmatrix}$$

3. In parts (a)-(c) below, a formula is given for calculating h given x and y . The values of x and y are given along with their respective uncertainties (assume they have no units). Calculate the value of h and its uncertainty. In each case, your result for h and its uncertainty should be written with an appropriate number of significant figures. For parts (a) and (b) evaluate derivatives analytically, and show your work. For part (c) it is highly recommended that you use Mathcad and numerically evaluate the partial derivatives (see `partial_derivs.mcd` for ideas). Turn in a neat printout of the Mathcad worksheet you used for part (c). Caution: Make sure these are your own worksheets!

(a) $h = x \ln y$ $x = 2.6 \pm 0.2$ $y = 150 \pm 15$

(b) $h = 4\pi xy^2$ $x = 65 \pm 7$, $y = 8.2 \pm 0.4$

(c) $h = \frac{\sqrt{k}}{1 + kx^2}$, where $k = \frac{x}{(1 + y)^2}$ $x = 0.50 \pm 0.05$, $y = 0.50 \pm 0.05$

4. (a) State the fractional uncertainties for x , y , and h for problem 3(a).
 (b) Does x or y contribute more to the uncertainty in h for problem 3(a)?