Lecture 2
Something you need to remember about Statistics - I.

No measurement made is ever exact…

Rules for rounding off numbers:

RESULT

SYSTEMATIC ERROR (determinate error)

RANDOM ERROR

PRECISION

ACCURACY

ABSOLUTE UNCERTAINTY

RELATIVE UNCERTAINTY =

PERCENT RELATIVE UNCERTAINTY =

PROPAGATION OF UNCERTAINTY FROM RANDOM ERROR

PROPAGATION OF UNCERTAINTY FORM SYSTEMATIC ERROR

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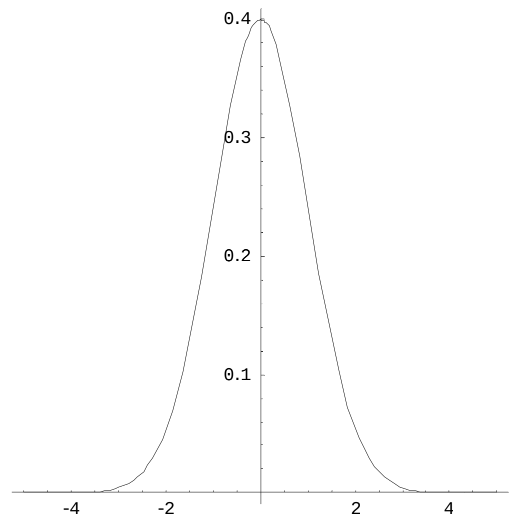

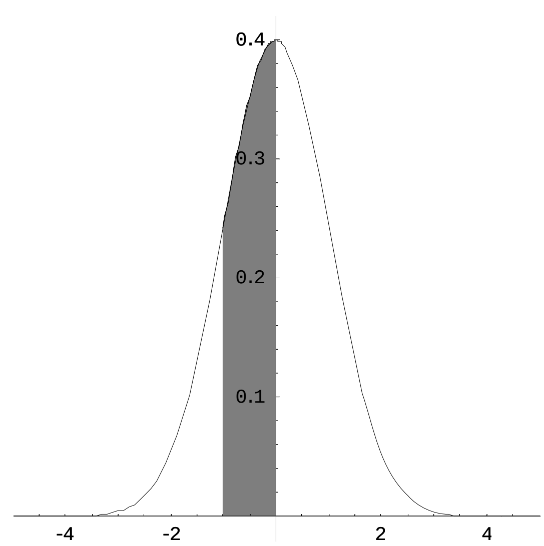

Homework:

Problem 1. Fill the table using the method we discussed.

Function	Uncertainty	Function	Uncertainty
$y = x_1 + x_2$		$y = x^a$	
$y = x_1 - x_2$		$y = \log x$	
$y = x_1 \cdot x_2$		$y = \ln x$	
$y = \frac{x_1}{x_2}$		$y = 10^x$	
		$y = e^x$	

Problem 2.
Use the table for the area for the normal (μ = 0 and σ = 1) error curve (Table 4-1 in the lecture notes) and determine what fraction of Gaussian population lies within the following interval: from (μ-σ) to (μ-0.5σ).

Appendix A

$$y = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma} \qquad z = \frac{x-\mu}{\sigma} \approx \frac{x-\overline{x}}{s}$$

Table 4–1 Ordinate and area for the normal (Gaussian) error curve, $y = \frac{1}{\sqrt{2\pi}} e^{-z^2/2}$

0z0[a]	y	Area[b]	0z0	y	Area	0z0	y	Area
0.0	0.398 9	0.000 0	1.4	0.149 7	0.419 2	2.8	0.007 9	0.497 4
0.1	0.397 0	0.039 8	1.5	0.129 5	0.433 2	2.9	0.006 0	0.498 1
0.2	0.391 0	0.079 3	1.6	0.110 9	0.445 2	3.0	0.004 4	0.498 650
0.3	0.381 4	0.117 9	1.7	0.094 1	0.455 4	3.1	0.003 3	0.499 032
0.4	0.368 3	0.155 4	1.8	0.079 0	0.464 1	3.2	0.002 4	0.499 313
0.5	0.352 1	0.191 5	1.9	0.065 6	0.471 3	3.3	0.001 7	0.499 517
0.6	0.333 2	0.225 8	2.0	0.054 0	0.477 3	3.4	0.001 2	0.499 663
0.7	0.312 3	0.258 0	2.1	0.044 0	0.482 1	3.5	0.000 9	0.499 767
0.8	0.289 7	0.288 1	2.2	0.035 5	0.486 1	3.6	0.000 6	0.499 841
0.9	0.266 1	0.315 9	2.3	0.028 3	0.489 3	3.7	0.000 4	0.499 904
1.0	0.242 0	0.341 3	2.4	0.022 4	0.491 8	3.8	0.000 3	0.499 928
1.1	0.217 9	0.364 3	2.5	0.017 5	0.493 8	3.9	0.000 2	0.499 952
1.2	0.194 2	0.384 9	2.6	0.013 6	0.495 3	4.0	0.000 1	0.499 968
1.3	0.171 4	0.403 2	2.7	0.010 4	0.496 5	∞	0	0.5

a. $z = (x - \mu)/\sigma$

b. The area refers to the area between z = 0 and z = the value in the table. Thus the area from z = 0 to z = 1.4 is 0.419 2. The area from z = –0.7 to z = 0 is the same as from z = 0 to z = 0.7. The area from z = –0.5 to z = +0.3 is (0.191 + 50.117 9) = 0.309 4. The total area between z = –∞ and z = +∞ is unity.

Table 4-1
Quantitative Chemical Analysis, Seventh Edition