

Lab-session 3

- 1) Use your solution to task 4 of Lab-session 2. In case you did not save your answers from last week, you can download the solution and Lab sheet 2 from the course website¹.
- (a) Modify your solution so that it also gives the values of the real and imaginary part of the roots when they are complex. Use the fact that, when the discriminant $\Delta = b^2 - 4ac < 0$, then the complex roots are given by:

$$x_1 = \frac{-b + i\sqrt{-\Delta}}{2a} \quad \text{and} \quad \frac{-b - i\sqrt{-\Delta}}{2a}.$$

- (b) Add some conditional formatting to the cells in such a way that if the roots are complex, then the background of cell B8 (see figure below) should be coloured in red, whereas if the roots are real the content of the same cell should be coloured in blue, with font style **bold**.

Hint: To do this you will need to choose the “Custom format ...” option in the formatting window (the last window on page 8 of week’s 4 lecture notes).

See the figure below for an example of how your WS should work,

	A	B	C	D	E
1	Quadratic equations $ax^2 + bx + c = 0$				
2					
3					
4					
5		a	b		c
6		1	2		-34
7					
8	Discriminant:	140			
9	Number of real roots:	2			
10	Root 1:	real part:	4,91608	imaginary part:	0
11	Root 2:	real part:	-6,91608	imaginary part:	0
12					

- 2) Produce a worksheet which determines whether a student has passed or failed the first year from the results of the courseworks and the exams (for simplicity take only three modules, including programming). The criteria for passing module A are more than 40 in coursework and more or equal to 35 in the exam. To pass module B you need more than 50 in coursework and more or equal to 40 in the exam. Programming has no coursework, but two exams in which you should achieve more than 39. Construct a function which uses these criteria in two different ways:

- (a) Use only nested IF-functions.
 (b) Use only one IF-function and the AND-function.

As an example you should produce for instance the table:

	A	B	C	D	E	F	G	H
1								
2								
3	Name	CW A	Exam A	CW B	Exam B	Exam 1 Pro	Exam 2 Pro	Result
4	J. Smith	56	78	51	56	67	78	Pass
5	Alistair C.	33	41	76	87	34	89	Fail
6	W. Rooney	76	81	91	89	79	100	Pass
7								

¹<http://www.staff.city.ac.uk/o.castro-alvaredo/PROGRAMMING1/programming1.html>

- 3) Write down the command line for a combination of Excel built-in functions which produces the following function

$$f(x) = \begin{cases} x^2 - 2x + 1 & \text{for } 0 \leq x \leq 1 \\ \sqrt{2x(x-1)} & \text{for } 1 < x \leq 2 \\ 2|x-3| & \text{for } x > 2 \\ 1 & \text{otherwise} \end{cases}$$

Use your function to compute $f(-2)$ and $f(5)$. Recall that the absolute value and the square root functions are the Excel built-in functions **ABS** and **SQRT**.

- 4) Write down the function (in a form similar to the equation for $f(x)$ in question 3)) that is produced by the following combination of Excel built-in functions:

$$= \text{IF}(x \leq 2, \text{IF}(x >= -2, 2, x), 4 - x).$$

Produce a sketch of this function (by hand) on the back of your lab sheet.