Informatics 1, 3ʳᵈ midterm (2018-12-3)

The answers should fit next to the questions, if you used a separate paper let us know clearly!

Wolfram Mathematica

1. What is the output after the following commands?
(4 points)

a) `N[3/5]`

b) `Plus @@ {{2,3,5}, {7,11,13}}`

c) `Table[j^i,{i,1,3},{j,1,2}]`

d) `Plot[x^2-2x+1,{x,-2,2}]`

2.

a) Define the function $f(x,y) = x^2 + y^2$!
Calculate $\frac{\delta f}{\delta x}(x,y) + \frac{\delta f}{\delta y}(x,y)$!   *(2 points)*

b) Integrate from -1 to 1 the bell curve $\left(\frac{1}{\sqrt{2\pi}} e^{-x^2/2} \right)$!
Determine for which c is the integral from $-c$ to c equal to 0.99? (use `NSolve[expression, variable]`)
(2 points)

3. What command results

a) the list of prime numbers $1 \le p \le 1000$ in the form $p = 7k+3$! (Hint: the function `PrimeQ` is the appropriate test-function)   *(2 points)*

b) the value of $\dfrac{1}{1+\dfrac{1}{1+\ldots\dfrac{1}{1+1}}}$ (with 100 fractions)!

(2 points)

`Sage`

4. With the help of `Sage` prove, that if $a > b$ are positive then $a^2 > b^2$! Take care of the definition of symbolic variables! *(2 points)*

5. Let $f(x) = x^3 + px + q$. Write commands for the following problems!

a) Define the function f! (here also create the symbolic variables) *(1 points)*

b) Solve the parametric equation $f'(x) = f''(x)$! (Use the function `solve(expression,variable)`) *(2 points)*

c) Substitute $p = -3$ and $q = 2$ in f! *(1 points)*

6. Get the list of triples $[i, j, k]$, where $1 \leq i, j, k < 10$ are integers and these numbers are the length of the sides of a non-degenerate triangle (thus each of i, j, k is less than the sum of the others)! *(2 points)*