Introduction to Mathematical Software Exercise 1

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Advice

Visit the course website at least once a week to stay up-to-date with recent announcements.

Problem 1 Getting Started

Check that your computer is operational. Log in to the account that is provided. If you experience difficulties, ask your tutors for help. Start a browser and check if the internet connection is working by opening a website that does not belong to TU Darmstadt (e.g. `http://www.google.com`). If it is not working, you have to set the proxy in your browser preferences to `proxy.mathematik.tu-darmstadt.de` with Port `80` for every protocol. Your internet connection should work now. You will need it in order to solve future exercises.

Problem 2 First Contact with Maple ☆☆★

Start Maple. One way to do this is to open a terminal window and type `xmaple`. The command `maple` would just start a command-line version of Maple.
Take the *Ten Minute Tour* by clicking `Help` → `Take a Tour of Maple` → `Ten Minute Tour`. You may skip the part about differential equations.
Also have a look at tour topic *Numeric and Symbolic Computations*.

Problem 3 Basic Maple Usage ☆☆★

Let Maple calculate the following expressions:

$$\frac{7}{9}+\frac{5}{\frac{4}{13}} \qquad \sqrt{3}\cdot\sin\left(\frac{2}{3}\cdot\pi\right) \qquad \int_0^{\pi}\frac{x^{\frac{5}{2}}}{x^2+1}\,\mathrm{d}x$$

$$\frac{\mathrm{d}}{\mathrm{d}t}\operatorname{arccosh}(t) \qquad \mathrm{e}^{\ln(42)} \qquad 0^0$$

Problem 4 Prime Numbers ☆☆★

Find out which of the following numbers are prime numbers:

a) 111111111111111111111

b) 1111111111111111111111

c) 4776913109852041418248056622882488319

d) 56713727820156410577229101238628035243

e) 3178104831739343598054823194332987197 61

Problem 5 Maple Help ☆★★

Find out, what the Maple functions `expand`, `factor` and `normal` do. What do they have in common? How do they differ from each other? Apply each of them to the following expression:

$$\frac{x^5 - y^5}{x^6 - y^6}$$

Problem 6 Growth ★★★

A biologist has developed the following formula to model the growth of a Goron:

$$f(x) = \frac{2500 \cdot e^{\frac{1}{100} \cdot x}}{5 \cdot \pi + e^{\frac{1}{100} \cdot x}}$$

($x \geq 0$ is the time in days, $f(x)$ is the mass of the Goron.)

a) Visualize the growth during the first three years.

b) How much does the Goron weigh at the beginning.

c) What is the maximal weight that he can achieve.

d) When is the growth rate maximal? Determine that rate.

e) When does the Goron achieve 80% of the maximal mass.

f) The y-axis, the line $y = 2500$ and the graph of f bound an area in the first quadrant of the coordinate system. Determine its area.