

Math 2250
Maple Project 1 Part A
August 2004

Due date: See the internet due dates. Maple lab 1 has parts A (problems 1.1, 1.2) and B (problems 1.3, 1.4, 1.5, 1.6), issued in two different documents. This document is part A.

References: Code in maple appears in 2250mapleL1a-F2004.txt at URL <http://www.math.utah.edu/~gustafso/>. This document: 2250mapleL1a-F2004.pdf.

Problem 1.1. (Quadratic equation)

Solve the quadratic equation $ax^2 + bx + c = 0$ and display its factorization:

(A) $a = 1, b = 4, c = 4$;

(B) $a = 1, b = 2, c = 3$;

(C) $a = 1, b = -4, c = 3$.

In your solution, show the solution steps by hand and also the maple code which checks the answer.

Problem 1.2. (Functions and plotting)

Define the following functions and plot domains, then plot them.

(A) $\sin(2x), 0 \leq x \leq 4\pi$.

(B) $|3x + 2|, -4 \leq x \leq 1$.

(C) $a + b \sin(c(t - t_0)), 0 \leq t \leq 24, a = 10, b = 1.5, c = \pi/12, t_0 = 12$.

Example 1. Solve $x^2 + 4x + 6 = 0$ by hand and check using maple.

Solution: The square-completion $(x+2)^2 + 2 = 0$ gives conjugate roots $x = -2 + \sqrt{2}i, x = -2 - \sqrt{2}i$. The factorization is $(x + 2 - \sqrt{2}i)(x + 2 + \sqrt{2}i) = 0$. The maple code which checks it is

```
eq:=x^2+4*x+6:
ans:=[solve(eq=0,x)];
eq1:=(x-ans[1])*(x-ans[2])=0;
expand(eq1);
```

Get maple help from `?solve`, `?expand` and `?factor` entered into a maple worksheet.

Example 2. Define a function $y = x^2 + 5x + 6$ on $-4 \leq x \leq -1$ using maple and plot it.

Solution: The maple code which applies is

```
f:=x->x^2+5*x+6:
a:=-4: b:=-1:
plot(f(x),x=a..b);
```

The inline function `f:=x->x^2+5*x+6` uses a minus sign (-) and a greater than sign (>) to separate the variable name (x) from the function definition ($x^2+5*x+6$). This construct is equivalent to using `f:=unapply(x^2+5*x+6,x)`. Get help by entering `?unapply` and `?plot` into a maple worksheet.

Example 3. Run the maple tutorial in maple versions 6,7,8,9.

Solution: In a maple worksheet, enter `?newuser` and choose the *New User's Tour*. In the tour, you will learn some basics of maple.

Hint on 1.2: Investigate the help panels for `cos`, `abs`, `exp`, `int` and `Int` (the inert version of `int`). Direct use of `int` in plot commands can produce unexpected results without any error message. The constant π is coded in maple as `Pi`, the upper and lowercase letters being significant. A common error is to code `c=Pi`; instead of the correct `c:=Pi`; . The error message *empty plot* can mean that a variable name is undefined. For example, `plot(x+PI,x=0..1)`; will not plot. To see why, use `p:=plot(x+PI,x=0..1)`; to display the plot data. The offending variable name is PI (different than Pi or pi).

End of Maple Lab 1 Part A.