

Math 2250
Maple Project 1 Part A
January 2005

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-S2005.txt at URL <http://www.math.utah.edu/~gustafso/>. This document: 2250mapleL1a-S2005.pdf.

Problem 1.1. (Quadratic equation)

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

- (A) $a = 2, b = 8, c = 8$;
- (B) $a = 2, b = 4, c = 12$;
- (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) $\cos(3x), 0 \leq x \leq 3\pi$.
- (B) $|2x + 3|, -2 \leq x \leq 1$.
- (C) $a + b \sin(c(t - t_0)), 0 \leq t \leq 24, a = 8, b = 5, c = \pi/12, t_0 = 12$.

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+5x+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.