Math 2250
Maple Project 1 Part A
January 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-S2004.txt` at URL `http://www.math.utah.edu/~gustafso/`. This document: `2250mapleL1a-S2004.pdf`.

Problem 1.1. (Quadratic equation)

Solve the quadratic equation $ax^2 + bx + c = 0$ and display its factorization:
(A) $a = 1$, $b = -2$, $c = 1$;
(B) $a = 1$, $b = 2$, $c = 3$;
(C) $a = 1$, $b = -3$, $c = 2$.
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) $\sin(2x)$, $0 \le x \le 4\pi$.
(B) $|x + 2|$,$-4 \le x \le 1$.
(C) $\int_0^x |\cos(e^x)|dx$, $0 \le x \le 3$.
(D) $a + b\sin(c(t - t_0))$, $0 \le t \le 24$, $a = 15$, $b = 1.1$, $c = \pi/12$, $t_0 = 12$.

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 $-4 \le x \le -1$ 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` and Int (the inert version of `int`). Beware of direct use of `int` in plot commands, as unexpected results can occur without any error message (try it on 1.2(C) for an illustration). 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.