

## LAB 0: INSTRUCTIONS FOR WRITE-UP

This assignment is ungraded. If you have difficulties with it, consult your instructors.

Prepare, print out, and hand in a Maple document with the following information. (I show what you are trying to calculate, but I do not show the response from Maple.)

Please include the specified *headers* in your worksheet (this is text that should be inserted into the worksheet at an appropriate place).

1—Header:

Your name, section, the date, and the title "Maple Lab 0"

2—Header: **Arithmetic**

Have Maple make the following calculations.

$2^{300} \cdot 300^2$

$4/7$

Ditto: `700 (%*700)`

$(\sqrt{2} - 1)^5$  expanded algebraically, and evaluated numerically

$e^{\pi\sqrt{163}}$ , with 30 digit accuracy. Use `exp` and `evalf`, and maybe some help from `help(evalf)`, or from Google, or from your instructor.

3—Header: **Algebra**

Factor the polynomial  $p = x^4 - 3x^2 + 1$ . Try it as follows.

`p:=x^4-3x^2+1`

`factor(p)`

`factor(p,real)`

Make (or tell Maple to make) the following substitutions in the expression

$$x^3y + xy^2$$

(a)  $x = 1$    (b)  $x = 1, y = x$    (c)  $x = y^2, y = x^3$

Use curly braces for multiple substitutions, for example:

`subs({x=1,y=x},x^3*y+x*y^2)`

Define  $f$  as the expression  $(x + 1/x)^3$

Find the value  $f(\sqrt[3]{2})$  both algebraically and numerically.

Define  $fx$  as the *function*  $x \rightarrow (x + 1/x)^3$ .

Find the value  $fx(\sqrt[3]{2})$  both algebraically and numerically.

Find the coefficient of  $r^7$  in  $p(r) = (r^2 + 3r + 4)^{10}$  in the following two ways:

- (a) By expanding  $p(r)$ , and looking for it;
- (b) By expanding  $p(r)/r^7$ , and looking for it.

Any preference?

#### 4—Header: **Calculus**

Calculate the second derivative of  $x^3 \ln x$  and of  $x^3 \ln^2 x$

(Note: there are four different ways you can write  $\ln^2 x$ , but Maple will only understand two of them. So take a look at your answer and see if it is reasonable.)

Calculate these integrals

$$(a) \int \frac{x^2}{x^2 + 1} dx \qquad (b) \int_0^{\infty} e^{-x^2} dx$$

Find the coefficient of  $r^7$  in  $p(r) = (r^2 + 3r + 4)^{10}$  using Taylor's formula:  $p^{(7)}(0)/7!$ . In other words, compute the 7th derivative, substitute 0, and divide by 7! (in one line, or in several lines).

#### 5) Header: **Graphing**

This requires the line:

```
with(plots):
```

Include the colon, or else Maple will tell you a lot of things you don't want to know.

Plot the functions  $p(x) = x^2$  and  $p(x) = x^4$  from  $x = -1$  to  $x = 1$  in a single convenient window.

Finally, we explore the graph of  $x^3 - 5xy^2 = 7$ .

Now we make two definitions.

```
f:=x^3-5*x*y^2
```

```
graph:= A→implicitplot(f=7,x=-A..A,y=-A..A)
```

This will give us the graph in a square window  $2A \times 2A$ .

Start with

```
A:=5; graph(A)
```

```
A:=50; graph(A)
```

Try a few other values of  $A$ . Use one value that looks reasonable and one value that looks unreasonable for your final answer.

Add some text saying which one is reasonable, and which one isn't.

Print out and turn in!