

Lab 4.

Integration by Parts.

This lab will test your ability to use the technique of integration called “integration by parts”, see section 7.4 in your book. We are going to see how we can use Maple for this. First we issue the command `with(student)`; among the commands listed there you will find `intparts`. To see how to use this we’ll work problem #7 on page 364. The object will be to produce a new integral which is in the table on page 366/7.

Issue the following commands:

```
>with(student);
```

```
>f:=x^3*ln(x);
```

```
>F:=Int(f,x);
```

We now figure out what the u function is. (Remember the formula is

$\int u v' dx = uv - \int u' v dx$.) In this case it is $\ln(x)$ and we write:

```
>step1:=intparts(F,ln(x));
```

You should get

$$\frac{1}{4}\ln(x)x^4 - \int \frac{1}{4}x^3 dx$$

The new integral is a simple power law, #1 in the table. Thus we have that

$$\int x^3 \ln(x) dx = \frac{1}{4}\ln(x)x^4 - \frac{x^4}{16} + C.$$

You can achieve these last few steps in Maple by the steps:

```
F:=value(step1)+C;
```

Now work the following problems the same way. Remember you must get an integral in the table on page 366/7.

1) $\int x 2^x dx,$

2) $\int x e^{4x} dx,$

3) $\int x \sec^2(x) dx,$

4) $\int \arctan(x) dx,$

5) $\int x \tan(x) \sec(x) dx,$

6) $\int \sin(x) \ln(\cos(x)) dx,$

7) $\int \sqrt{x} \ln(x) dx,$

8) $\int x^3 \ln(x) dx,$

9) $\int x \sin(3x) dx,$

10) $\int \arccot(x) dx.$

11) $\int \arcsin(x) dx.$

12) $\int \frac{x^5}{\sqrt{1-x^3}} dx.$