

MATHEMATICS 201-203-RE

Integral Calculus

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Integrals and Sums with Maple

• Basic Integration

To integrate expressions using Maple, we use the **Int** command.

For example, suppose we want to evaluate $\int (x^2 + \frac{1}{x}) dx$. From the techniques of integration seen in class it is easy to see that we have $\int (x^2 + \frac{1}{x}) dx = \frac{1}{3}x^3 + \ln|x| + C$. Using Maple,

```
int(x^2+1/x, x);
```

Here the **x** at the end means that we are integrating with respect to **x**. First, note that Maple omits the constant of integration. That is, it gives us a particular antiderivative, not the most general one. Second, Maple omits the absolute value sign. This is fine if $x > 0$, but for values of x less than that, then we would need to insert the absolute value ourselves.

If an uppercase **I** is used in the command, Maple will display the integral without evaluation it, so that it can be checked for errors. The evaluation is then done with the command **value(%)**.

```
Int(x^2+1/x, x); value(%);
```

Or, with a little “cut-and-paste”:

```
Int(x^2+1/x, x) = int(x^2+1/x, x);
```

For definite integrals, for example $\int_1^2 (x^2 + \frac{1}{x}) dx$, we simply enter the range, **int(f(x), x = a..b)**.

```
Int(x^2+1/x, x = 1 .. 2) = int(x^2+1/x, x = 1 .. 2);
```

• Sums

The basic command for sums with Maple is **sum**. It works the same way as with integration.

For example $\sum_{i=3}^{12} i^2$ would be given by

```
sum(i^2, i = 3 .. 12);
```

or, in the format to verify for errors in the writing,

```
Sum(i^2, i = 3 .. 12) = sum(i^2, i = 3 .. 12);
```

• Riemann Sums

In the “**student**” package, Maple has commands to find the Riemman sum and draw the rectangles for a given value of n . The commands are **rightsum**, **leftsum** and **middlesum** to evaluate the sum and **rightbox**, **leftbox** and **middlebox** to draw the rectangles.

For example, approximating $\int_0^2 \sin(x^2) dx$ with 10 rectangles using the right-hand endpoints of the subintervals, we have

```
with(student):
```

```
rightsum(sin(x^2), x=0..2, 10);
```

```
rightbox(sin(x^2), x=0..2, 10);
```