

Integration by Substitution and by Parts in Maple

Maple knows all the basic techniques of integration that we are supposed to learn, including substitution, integration by parts and more. Maple applies these techniques without telling us about it and comes up with a final answer.

In the following example, execute the command code by hitting return at the end of the line. Int displays the integral while int computes it:

```
> Int(arctan(x), x); int(arctan(x), x);
```

$$\int \arctan(x) \, dx$$
$$x \arctan(x) - \frac{1}{2} \ln(x^2 + 1) \quad (1)$$

Activity 1: Replicate Maple's answer using by-hand work. Please note that it should be + C at the end, but Maple leaves that off!

Activity 2: Test a few of the integrals from class as you get familiar with the Maple code. Ask me any questions as I make my way around-I'm always happy to help (and to help give hints when you are stuck)!

```
>  
>  
>  
>  
>
```

Activity 3: Execute the command and then replicate Maple's answer using by-hand work.

```
> Int(x^3*ln(x), x); int(x^3*ln(x), x);
```

$$\int x^3 \ln(x) \, dx$$
$$\frac{1}{4} x^4 \ln(x) - \frac{1}{16} x^4 \quad (2)$$

Activity 4: Execute the command and then replicate Maple's answer using by-hand work.

```
> Int((ln(t))^2, t); int((ln(t))^2, t);
```

$$\int \ln(t)^2 \, dt$$
$$\ln(t)^2 t - 2 t \ln(t) + 2 t \quad (3)$$

Activity 5: Execute the command and then replicate Maple's answer using by-hand work.

```
> Int(x^2*exp(2*x), x); int(x^2*exp(2*x), x);
```

$$\int x^2 e^{2x} \, dx$$
$$\frac{1}{4} (2x^2 - 2x + 1) e^{2x} \quad (4)$$

Activity 6: Execute the command and then replicate Maple's answer using by-hand work.

```
> Int(exp(x)*sin(x), x); int(exp(x)*sin(x), x);
```

$$\int e^x \sin(x) \, dx$$
$$-\frac{1}{2} e^x \cos(x) + \frac{1}{2} e^x \sin(x) \quad (5)$$