

Useful Maple Commands

Cryptography, Winter 2002

In these examples, the > is Maple's prompt. All commands must end with a semicolon.

1. Arithmetic.

```
> 423 + 1347*2;
```

3117

```
> 50! + 2^50;
```

30414093201713378043612608166064768844377641568961637899906842624

```
> sum(26!/((26-2*k)!*2^k*k!), k=0..13);
```

532985208200576

2. Modular arithmetic.

```
> 423 + 1347*2 mod 100;
```

117

```
> 1756 &^ 8732 mod 2301;
```

1327

```
> 1/48 mod 1001;
```

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3. Phi function.

```
> with(numtheory):
```

```
> phi(49);
```

42

4. Factoring integers and testing primes.

```
> ifactor(7007);
```

$(7)^2 (11) (13)$

```
> isprime(10^11+1);
```

false

```
> isprime(10^11+3);
```

true

5. Expanding and factoring algebraic expressions.

```
> expand((x+1)^2*(x-2));
```

$x^3 - 3x - 2$

```
> factor(x^2 + 2*x + 1);
```

$(x + 1)^2$

6. Saving expressions in a variable.

```
> z := 2;  
> z+1;
```

3

```
> ans := (x+1)^4;  
> expand(ans);
```

$$x^4 + 4x^3 + 6x^2 + 4x + 1$$

7. Linear Algebra

```
> with(linalg):  
> A := matrix(3,3,[9,12,8,13,16,11,34,23,-1]);
```

$$A := \begin{bmatrix} 9 & 12 & 8 \\ 13 & 16 & 11 \\ 34 & 23 & -1 \end{bmatrix}$$

```
> det(A);
```

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```
> B := Inverse(A) mod 53;
```

$$B := \begin{bmatrix} 2 & 8 & 51 \\ 45 & 8 & 24 \\ 43 & 32 & 6 \end{bmatrix}$$

```
> multiply(A, B);
```

$$\begin{bmatrix} 902 & 424 & 795 \\ 1219 & 584 & 1113 \\ 1060 & 424 & 2280 \end{bmatrix}$$

8. Calculus (exp(x) denotes the function e^x).

```
> diff(x*sin(x), x);
```

$$\sin(x) + x \cos(x)$$

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

$$x^2e^x - 2xe^x + 2e^x$$

```
> taylor(exp(x), x=0, 7);
```

$$1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 + \frac{1}{720}x^6 + O(x^7)$$

9. Help.

```
> ?diff  
> ?linalg
```

Requests help pages, on the differentiate command, and functions in the linear algebra package. (No semicolon needed here.)