diff or Diff - differentiation or partial differentiation

	•	
diff(f, x1,, xj)	$\frac{\mathrm{d}^{j}}{\mathrm{d}x_{j}\ldots\mathrm{d}x_{l}}f$	
diff(f, [x1\$n])	$\frac{\mathrm{d}^n}{\mathrm{d}x_1^n}f$	
diff(f, x1\$n, [x2\$n, x3], , xj, [xk\$m])	$\frac{\mathrm{d}^r}{\mathrm{d}x_k^m \mathrm{d}x_j \dots \mathrm{d}x_3 \mathrm{d}x_2^n \mathrm{d}x_1^n} f$	
f -	algebraic expression or an equation	
x1, x2,, xj - names representing differentiation variables		
	algebraic expression entering constructions like x , representing nth order derivative, assumed to be integer order differentiation	
Find $\frac{d(x \sin(cosx))}{d(x \sin(cosx))}$		

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

 $\sin(\cos(x)) - x\cos(\cos(x))\sin(x)$

Find higher order derivatives.

Find $\frac{d^3sinx}{dx^3}$ > diff(sin(x),x\$3);

 $-\cos(x)$

Compute partial derivatives.

Ex:Find $\frac{\partial^2 (x^2 + x y^2)}{\partial y \partial x}$. > diff(x^2+x*y^2,x,y);

2y

The Diff command is inert, it returns unevaluated.

> Diff(tan(x),x);

$$\frac{\mathrm{d}}{\mathrm{d}x}\tan(x)$$

The command map (f,list) applies the function f to each elements of the list. Ex: To find third derivative of sin x, tanx and $\cot^{-1}x$. Sol: > map(diff,[sin(x),tan(x), arccot(x)], x\$3);

$$\left[-\cos(x), 2\left(1 + \tan(x)^{2}\right)^{2} + 4\tan(x)^{2}\left(1 + \tan(x)^{2}\right), -\frac{8x^{2}}{\left(1 + x^{2}\right)^{3}} + \frac{2}{\left(1 + x^{2}\right)^{2}}\right]$$

implicitdiff

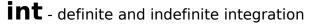
- differentiation of a function defined by an equation

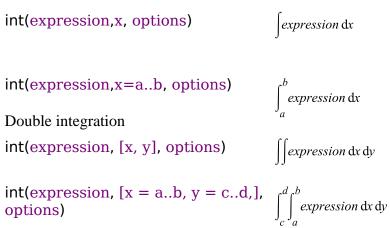
```
implicitdiff(f, y, x)
```

```
f algebraic expressions or equations
```

y (variable) name or function of dependent variable x name (of derivative variable)

EX: find $\frac{dy}{dx}$ and from $x^2+y^2=1$ Sol: implicitdiff($x^2+y^2=1,y,x$) Ex: Find $\frac{d^2y}{dx^2}$ if $x^2+y^3=1$. Answer: $f := x^2 + y^3 = 1;$ implicitdiff(f, y, x, x); $-\frac{2}{9} \frac{3y^3+4x^2}{y^5}$





expression	- algebraic expression; integrand
х, у	- names; variables of integration
a, b, c, d	- endpoints of interval on which integral is taken
options	(optional) various options to control the type of integration performed.

options - (optional) various options to control the type of integration performed.

> Int(f, x)> $\mathbf{v} := Int(f(\mathbf{x}), \mathbf{x} = \mathbf{a..b});$ $v := \int_{a}^{b} f(x) dx$

> Int(f, x, y)

> Int(f, x, y, z)

 $\iint f \, \mathrm{d}x \, \mathrm{d}y$

Double integral

Triple integral

 $\iiint f \, \mathrm{d} x \, \mathrm{d} y \, \mathrm{d} z$

Examples

```
> int( x/(x^{3-1}), x );
```

$$\frac{1}{3}\ln(x-1) - \frac{1}{6}\ln(x^2 + x + 1) + \frac{1}{3}\sqrt{3}\arctan\left(\frac{1}{3}(2x + 1)\sqrt{3}\right)$$

> int(exp(-x^2)*ln(x), x=0..infinity); $-\frac{1}{4}\sqrt{\pi}\gamma - \frac{1}{2}\sqrt{\pi}\ln(2)$

A double integral

> int(x*y^2, [x, y]);

$$\frac{1}{6}x^2y^3$$

> int($x*y^2$, [x = 0..y, y = -2..2]); $\frac{32}{5}$

Find:

1)
$$\int_{0}^{1} e^{x^{3}} dx > f := int(\exp(x^{3}), x = 0..1);$$

$$f := \int_{0}^{1} \int_{0}^{3} dx$$

> *evalf*(%)

1.341904418

> $int(exp(x^3), x = 0..1, numeric)$ 1.341904418

$$f := \int_{a}^{b} \frac{1}{x} dx$$

$$f := int \left(\frac{1}{x}, x = a . b \right);$$
Warning, unable to determine if 0 is between a and b; try
to use assumptions or use the AllSolutions option
$$f := \int_{a}^{b} \frac{1}{x} dx$$

4)Find integral of sinx , tanx and lnx to each elements.

, map(int, $[\sin(x), \tan(x), \ln(x)], x$)

 $5) \int_{0}^{1} e^{-x^{2}} \ln(x) \, dx$

 $\bf 6\bf)$ Find the third integral of cos2x , cot3x and sin^1 2x to each elements.

7) $\int x e^{ax} \sin(bx) dx$