## Integral

integral ( $\mathrm{f}, \mathrm{x}$ ) returns the integral of $f$ with respect to $x$.
integral ( $\mathrm{x}^{\wedge} 2, \mathrm{x}$ )
$\frac{1}{3} x^{3}$
Extend the argument list for multiple integrals.
$\mathrm{f}=\mathrm{x}$ y
integral( $f, x, y$ )
$\frac{1}{4} x^{2} y^{2}$
defint ( $\mathrm{f}, \mathrm{x}, \mathrm{a}, \mathrm{b}$ ) computes the definite integral of $f$ with respect to $x$ evaluated from $a$ to $b$. The argument list can be extended for multiple integrals. The following example computes the integral of $f=x^{2}$ over the domain of a semicircle. For each $x$ along the abscissa, $y$ ranges from 0 to $\sqrt{1-x^{2}}$.

```
defint(x^2, y, 0, sqrt(1 - x^2), x, -1, 1)
```

$\frac{1}{8} \pi$
Alternatively, eval can be used to compute a definite integral step by step.
I = integral ( $\mathrm{x}^{\wedge} 2, \mathrm{y}$ )
I = eval(I,y,sqrt(1-x^2)) - eval(I,y,0)
I = integral ( $\mathrm{I}, \mathrm{x}$ )
eval(I, $x, 1)-\operatorname{eval}(I, x,-1)$
$\frac{1}{8} \pi$
Here is a useful trick. Integrals involving sine and cosine can often be solved using exponentials. For example, the definite integral

$$
\int_{0}^{2 \pi}\left(\sin ^{4} t-2 \cos ^{3}(t / 2) \sin t\right) d t
$$

can be solved as follows.

```
f = sin(t)^4 - 2 cos(t/2)^3 sin(t)
f = circexp(f)
defint(f, t, 0, 2 pi)
\frac{3}{4}}\pi-\frac{16}{5
```

