Einfache Berechnungen

```
> 4+7;
```

$$11 \tag{1.1}$$

```
> Pi;
```

$$\pi \tag{1.2}$$

```
> sin(Pi);
```

$$0 \tag{1.3}$$

```
> exp(5);
```

$$e^5 \tag{1.4}$$

```
> evalf(exp(5), 50);
```

$$148.41315910257660342111558004055227962348766759388 \tag{1.5}$$

```
> evalf(Pi, 500);
```

$$3.1415926535897932384626433832795028841971693993751058209749445923078164062\backslash \tag{1.6}$$
$$8620899862803482534211706798214808651328230664709384460955058223172535 9\backslash$$
$$4081284811174502841027019385211055596446229489549303819644288109756659 3\backslash$$
$$3446128475648233786783165271201909145648566923460348610454326648213393 6\backslash$$
$$0726024914127372458700660631558817488152092096282925409171536436789259 0\backslash$$
$$3600113305305488204665213841469519415116094330572703657595919530921861 1\backslash$$
$$7381932611793105118548074462379962749567351885752724891227938183011949 1$$

Listen, Mengen, Folgen, Summen und Produkte

Liste:

```
> L:=[a, a, b, b, c, c];
```

$$L := [a, a, b, b, c, c] \tag{2.1}$$

```
> L[1];
```

$$a \tag{2.2}$$

```
> L[3];
```

$$b \tag{2.3}$$

```
> L[-1];
```

$$c \tag{2.4}$$

```
> op(L);
```

$$a, a, b, b, c, c \tag{2.5}$$

```
> L:=[op(L), d, d];
```

$$L := [a, a, b, b, c, c, d, d] \tag{2.6}$$

Menge:

```
> M:={a, a, b, b, c, c};
```

$$M := \{a, c, b\} \tag{2.7}$$

```
> op(M);
```

$$a, c, b \tag{2.8}$$

```
> M:=M union {d};
```

$$M := \{a, d, c, b\} \tag{2.9}$$

Folgen:

```
> seq(k^2, k=1..20);
```

$$1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400 \quad (2.10)$$

```
> A:=[seq(k^2, k=1..20)];
```

$$A := [1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400] \quad (2.11)$$

```
> Z:=NULL:
  for i from 1 to 20 do Z:=Z, i^2 end do:
  Z;
```

$$1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400 \quad (2.12)$$

Summe:

```
> sum(k^2, k=1..20);
```

$$2870 \quad (2.13)$$

```
> convert(A,`+`);
```

$$2870 \quad (2.14)$$

```
> B:=sum(k^2, k=1..n);
```

$$B := \frac{1}{3}(nA1)^3 I \frac{1}{2}(nA1)^2 A \frac{1}{6} nA \frac{1}{6} \quad (2.15)$$

Produkte:

```
> product(k^2, k=1..20);
```

$$591901218138992768541744168960000000 \quad (2.16)$$

```
> convert(A,`*`);
```

$$591901218138992768541744168960000000 \quad (2.17)$$

Vereinfachung und Umwandlung von Termen

```
> B;
```

$$\frac{1}{3}(nA1)^3 I \frac{1}{2}(nA1)^2 A \frac{1}{6} nA \frac{1}{6} \quad (3.1)$$

```
> expand(B);
```

$$\frac{1}{3} n^3 A \frac{1}{2} n^2 A \frac{1}{6} n \quad (3.2)$$

```
> factor(B);
```

$$\frac{1}{6} n(nA1)(2nA1) \quad (3.3)$$

```
> p:=product(x-2*j, j=0..100);
```

$$p := x(xI2)(xI4)(xI6)(xI8)(xI10)(xI12)(xI14)(xI16)(x \quad (3.4)$$
$$I18)(xI20)(xI22)(xI24)(xI26)(xI28)(xI30)(xI32)(x$$
$$I34)(xI36)(xI38)(xI40)(xI42)(xI44)(xI46)(xI48)(x$$
$$I50)(xI52)(xI54)(xI56)(xI58)(xI60)(xI62)(xI64)(x$$
$$I66)(xI68)(xI70)(xI72)(xI74)(xI76)(xI78)(xI80)(x$$
$$I82)(xI84)(xI86)(xI88)(xI90)(xI92)(xI94)(xI96)(x$$
$$I98)(xI100)(xI102)(xI104)(xI106)(xI108)(xI110)(x$$
$$I112)(xI114)(xI116)(xI118)(xI120)(xI122)(xI124)(x$$
$$I126)(xI128)(xI130)(xI132)(xI134)(xI136)(xI138)(x$$

```
    I  140) (xI  142) (xI  144) (xI  146) (xI  148) (xI  150) (xI  152) (x
    I  154) (xI  156) (xI  158) (xI  160) (xI  162) (xI  164) (xI  166) (x
    I  168) (xI  170) (xI  172) (xI  174) (xI  176) (xI  178) (xI  180) (x
    I  182) (xI  184) (xI  186) (xI  188) (xI  190) (xI  192) (xI  194) (x
    I  196) (xI  198) (xI  200)
M  p:=expand(p):
M  factor(p);
```

$$p \tag{3.5}$$

```
M  q:=2*x^2*y^3+4*x*y+2*x^3+5*y-2*x*y+4*x^3*x^5-3*x^3*y+4*x*y^2
   -8*x^2*y;
```

$$q := 2x^2y^3 + 2xy + 2x^3 + 5y + 4x^8 - 3x^3y + 4xy^2 - 8x^2y \tag{3.6}$$

```
M  C:=collect(q,x);
```

$$C := 4x^8 + (-3y + 2)x^3 + (2y^3 - 8y)x^2 + (2y + 4y^2)x + 5y \tag{3.7}$$

```
M  collect(q,y);
```

$$2x^2y^3 + 4xy^2 + (2x + 5) - 3x^3 - 8x^2)y + 4x^8 + 2x^3 \tag{3.8}$$

```
M  collect(q,x,factor);
```

$$4x^8 + (-3y + 2)x^3 + 2y(y - 2)(y + 2)x^2 + 2y(1 + 2y)x + 5y \tag{3.9}$$

```
M  collect(q,y,factor);
```

$$2x^2y^3 + 4xy^2 + (2x + 5) - 3x^3 - 8x^2)y + 2x^3(2x^5 + 1) \tag{3.10}$$

```
M  subs(y=1,C);
```

$$4x^8 - x^3 - 6x^2 + 6x + 5 \tag{3.11}$$

Funktionen und Prozeduren

```
M  f:=x->x^2;
```

$$f := x \to x^2 \tag{4.1}$$

```
M  f(a);
```

$$a^2 \tag{4.2}$$

```
M  f(-a);
```

$$a^2 \tag{4.3}$$

```
M  f(6);
```

$$36 \tag{4.4}$$

```
M  f(3.25432674534536);
```

$$10.59064256 \tag{4.5}$$

```
M  g:=(x,y)->sin(sqrt(x^2+y^2))/sqrt(x^2+y^2);
```

$$g := (x, y) \to \frac{\sin\left(\sqrt{x^2 + y^2}\right)}{\sqrt{x^2 + y^2}} \tag{4.6}$$

```
M  g(a,b);
```

$$\frac{\sin\left(\sqrt{a^2 + b^2}\right)}{\sqrt{a^2 + b^2}} \tag{4.7}$$

```
M  g(3,2);
```

$$\frac{1}{13}\sin\left(\sqrt{13}\right)\sqrt{13} \tag{4.8}$$

```
M  evalf(%);
```

$$I\ 0.1241118812 \tag{4.9}$$

```
M  ggT:=proc(a,b)
   local r;
      if b>a then ggT(b,a) end if;
      if b=0 then return a end if;
      r:=a mod b;
      return ggT(b,r)
   end proc:
M  ggT(163029660,1717313565);
```

$$255 \tag{4.10}$$

```
M  ifactor(163029660);
```

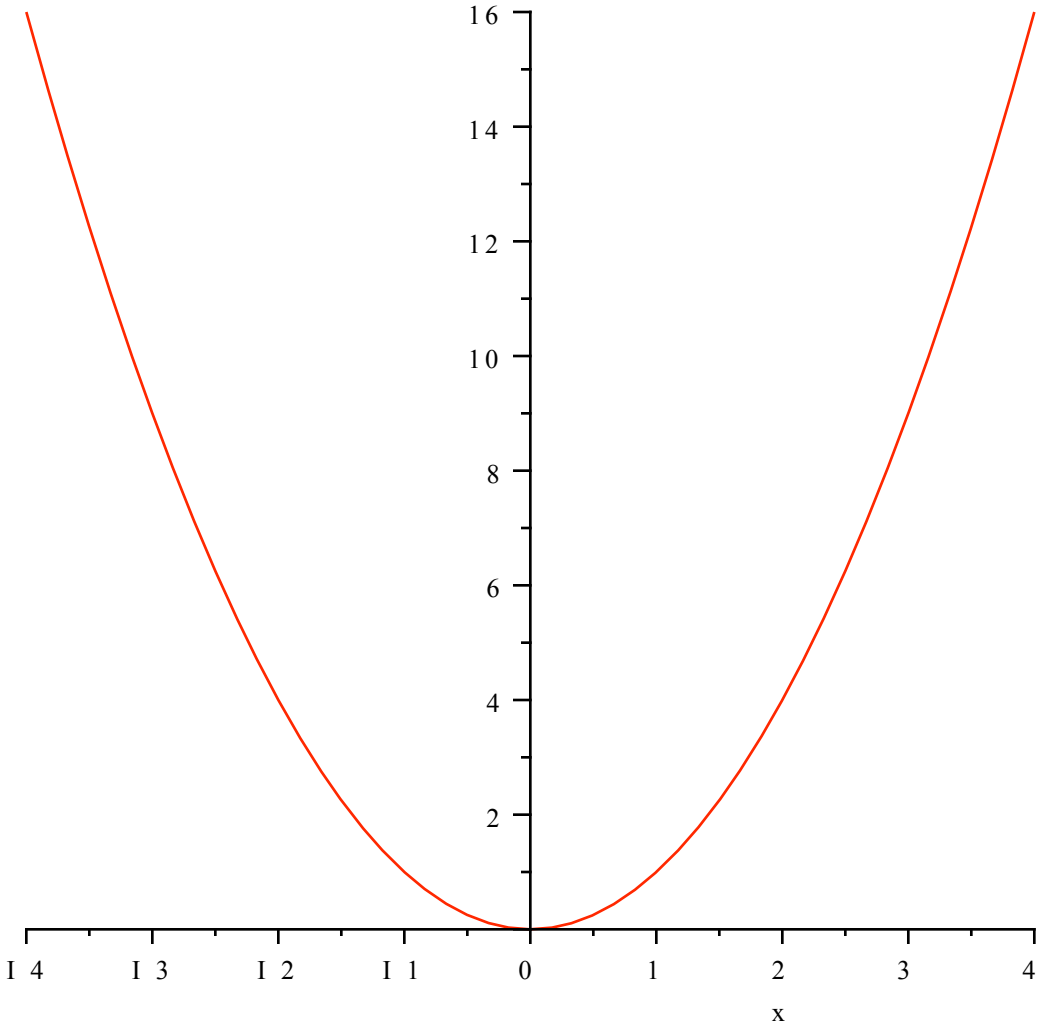
$$(2)^2(3)(5)(17)(159833) \tag{4.11}$$

```
M  ifactor(1717313565);
```

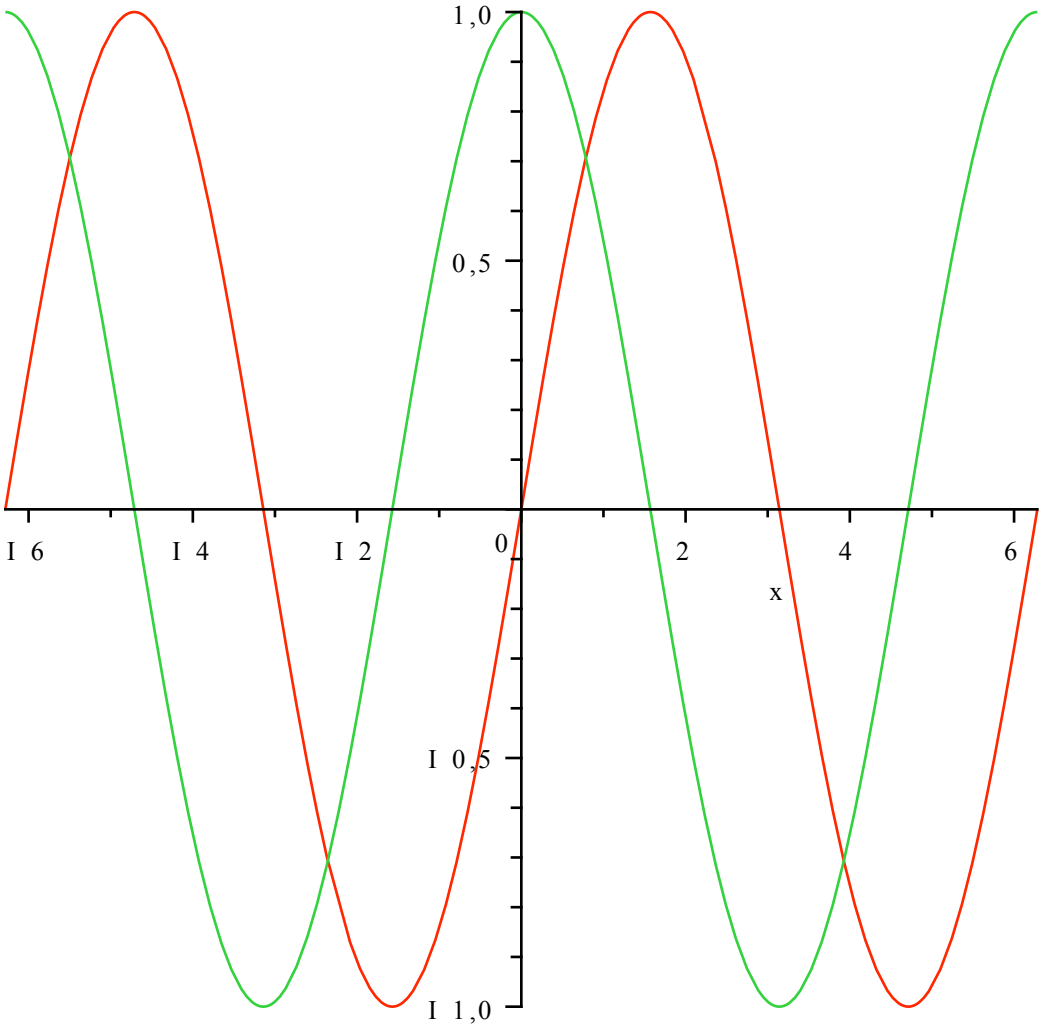
$$(3)(5)(11)(17)(71)(8623) \tag{4.12}$$

Plotten von Graphen und Animationen

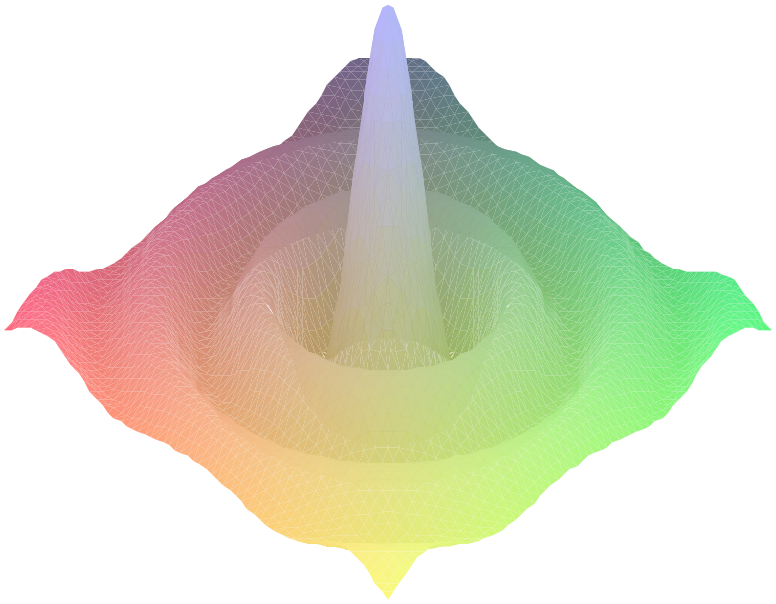
```
M  plot(f(x),x=-4..4);
```



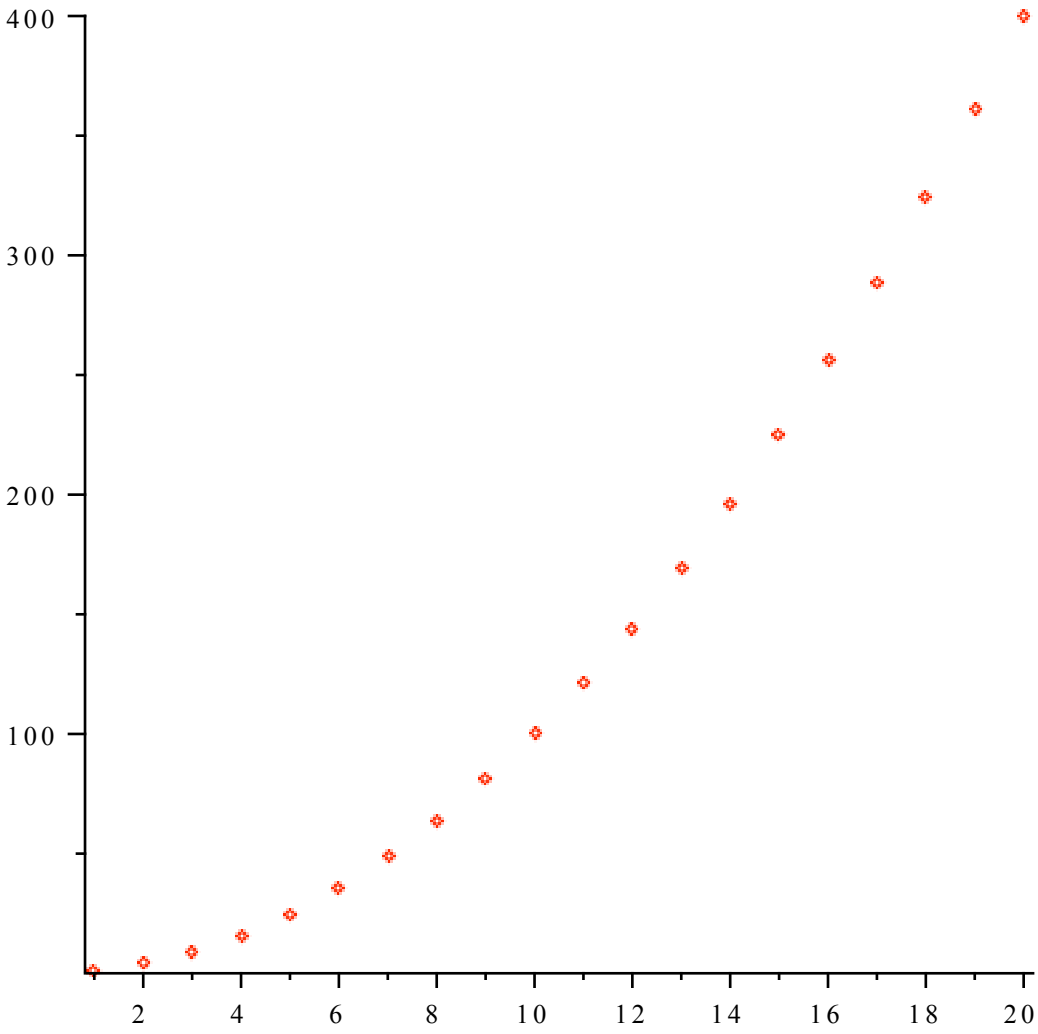

```
M  plot([sin(x),cos(x)],x=-2*Pi..2*Pi,view=[-2*Pi..2*Pi,-1..1]);
```



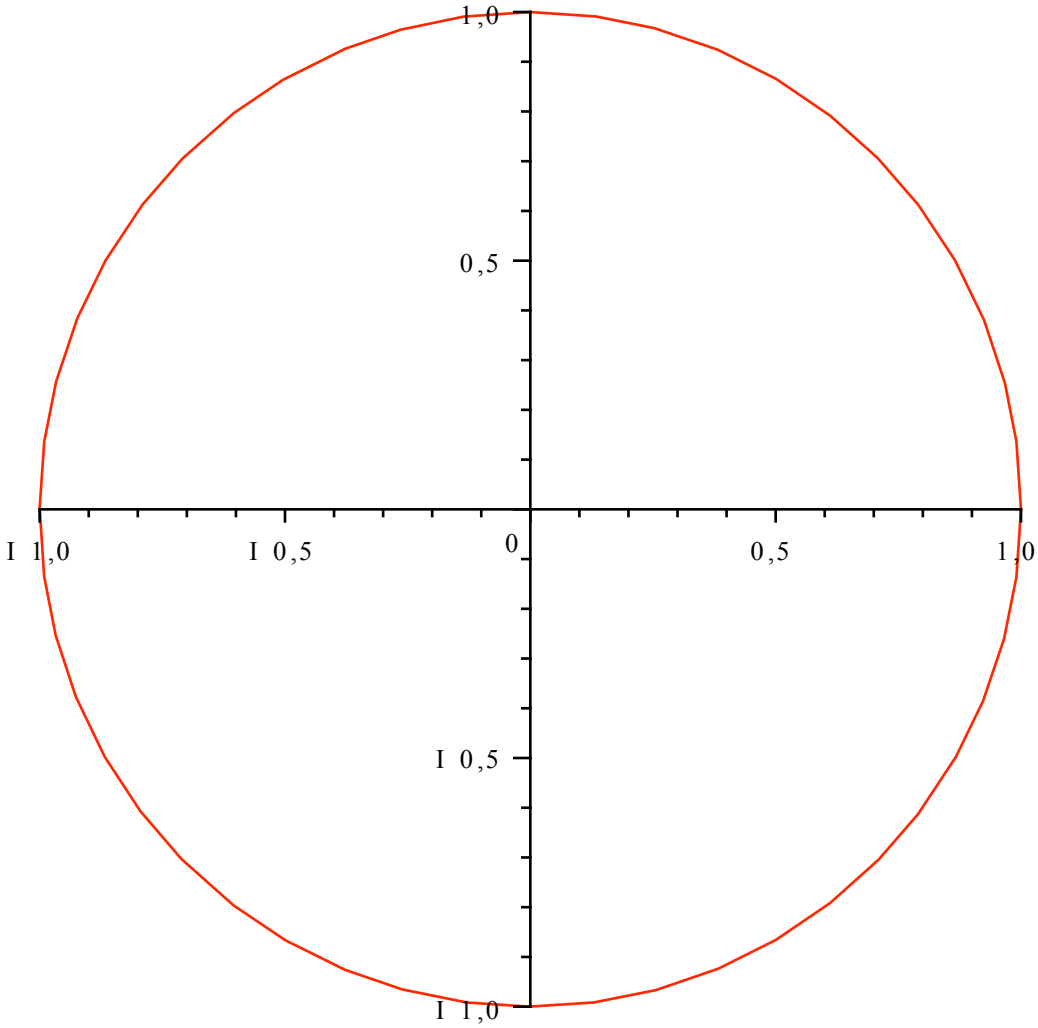

```
Mplot3d(g(x,y),x=-16..16,y=-16..16,numpoints=4000,style=surface);
```



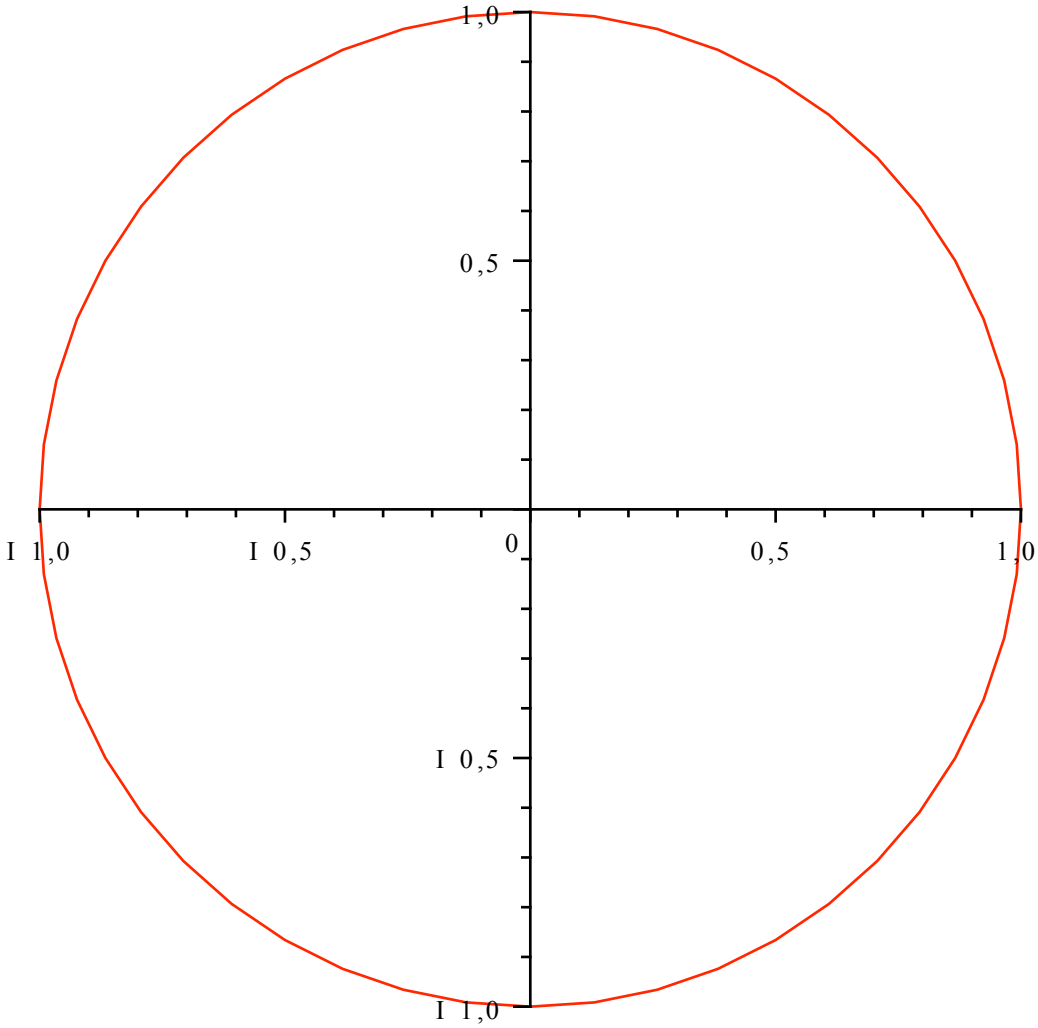
```
> plots[listplot](A, color=red, style=point);
```



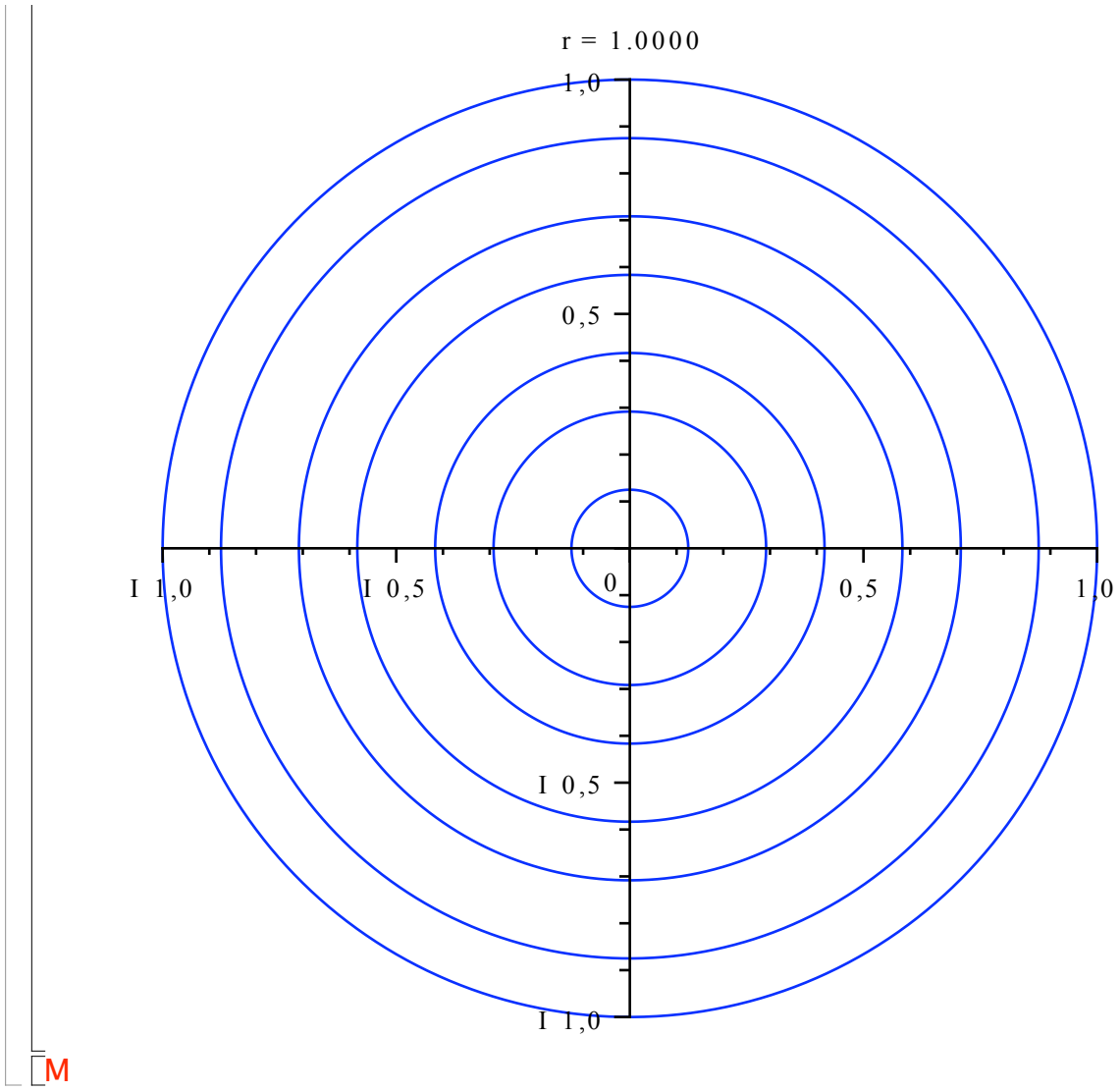

```
M  plot([cos(t),sin(t),t=0..2*Pi]);
```




```
> plots[animatecurve]([cos(t),sin(t),t=0..2*Pi],view=[-1..1,-1..1]);
```




```
restart;
plots[animate](plot,[[r*cos(t),r*sin(t),t=0..2*Pi],scaling=
constrained,numpoints=250,color=blue],r=0..1,view=[-1..1,-1.
.1],trace=7);
```



M