

# Lab1Talk

```
2+2
```

```
4
```

```
36502386752835682367458236745827364587246345*36752834576547263545794623756  
13415661819761200585655961787183019693653468692716005081134265808529601583685
```

```
2^1000
```

```
107150860718626732094842504906000181056140481170553360744375038837035105112493612249
```

```
print(2^1000)
```

```
10715086071862673209484250490600018105614048117055336074437503883703\  
51051124936122493198378815695858127594672917553146825187145285692314\  
04359845775746985748039345677748242309854210746050623711418779541821\  
53046474983581941267398767559165543946077062914571196477686542167660\  
429831652624386837205668069376
```

```
factorial(4)
```

```
24
```

```
4.factorial()
```

```
24
```

```
print(100.factorial())
```

```
93326215443944152681699238856266700490715968264381621468592963895217\  
59999322991560894146397615651828625369792082722375825118521091686400\  
00000000000000000000
```

```
137/54 + (39/500)^5
```

```
2140627436053373  
843750000000000
```

```
(137/54 + (39/500)^5).n()
```

```
2.53703992421141
```

```
n(137/54 + (39/500)^5)
```

```
2.53703992421141
```

```
pi.n()
```

```
3.14159265358979
```

```
print(pi.n(digits=1000))
```

```
3.141592653589793238462643383279502884197169399375105820974944592307\  
81640628620899862803482534211706798214808651328230664709384460955058\  
22317253594081284811174502841027019385211055596446229489549303819644\  
28810975665933446128475648233786783165271201909145648566923460348610\  
45432664821339360726024914127372458700660631558817488152092096282925\  
40917153643678925903600113305305488204665213841469519415116094330572\  
70365759591953092186117381932611793105118548074462379962749567351885\  
75272489122793818301194912983367336244065664308602139494639522473719\  
07021798609437027705392171762931767523846748184676694051320005681271\  
45263560827785771342757789609173637178721468440901224953430146549585\  
37105079227968925892354201995611212902196086403441815981362977477130\  
99605187072113499999983729780499510597317328160963185950244594553469\  
08302642522308253344685035261931188171010003137838752886587533208381\  
1
```

```
42061717766914730359825349042875546873115956286388235378759375195778\  
1857780532171226806613001927876611195909216420199
```

```
(3/2)^10*sqrt(5)
```

$$\frac{59049}{1024} \sqrt{5}$$

```
_.n()
```

```
128.942947268931
```

```
(6*x+5)^4 * (x^2+1)^3 * (2*x-1)^5
```

$$(2x - 1)^5 (6x + 5)^4 (x^2 + 1)^3$$

```
expand(_)
```

$$41472 x^{15} + 34560 x^{14} + 55296 x^{13} + 61440 x^{12} - 30784 x^{11} - 7136 x^{10} - 29728 x^9 - 44848 x^8 + 296$$

```
factor(_)
```

$$(2x - 1)^5 (6x + 5)^4 (x^2 + 1)^3$$

```
solve(x^2-5*x+2 == 0, x)
```

$$[x == -1/2 * \text{sqrt}(17) + 5/2, x == 1/2 * \text{sqrt}(17) + 5/2]$$

```
for r in _:  
    show(r)
```

$$x = -\frac{1}{2} \sqrt{17} + \frac{5}{2}$$

$$x = \frac{1}{2} \sqrt{17} + \frac{5}{2}$$

```
var('a b c d')
```

```
(a,b,c,d)
```

```
solve(a*x^3 + b*x^2 + c*x + d == 0, x)
```

$$[x == -1/2 * (I * \text{sqrt}(3) + 1) * (1/18 * \text{sqrt}(27 * a^2 * d^2 + 4 * a * c^3 - b^2 * c^2 - 2 * (9 * a * b * c -$$

```
for r in _:  
    show(r)
```

$$x = -\frac{1}{2}(I\sqrt{3} + 1)\left(\frac{1}{18} \frac{\sqrt{27a^2d^2 + 4ac^3 - b^2c^2 - 2(9abc - 2b^3)d}\sqrt{3}}{a^2} - \frac{1}{54} \frac{(27a^2d - 9abc + 2b^3)}{a^3}\right)$$

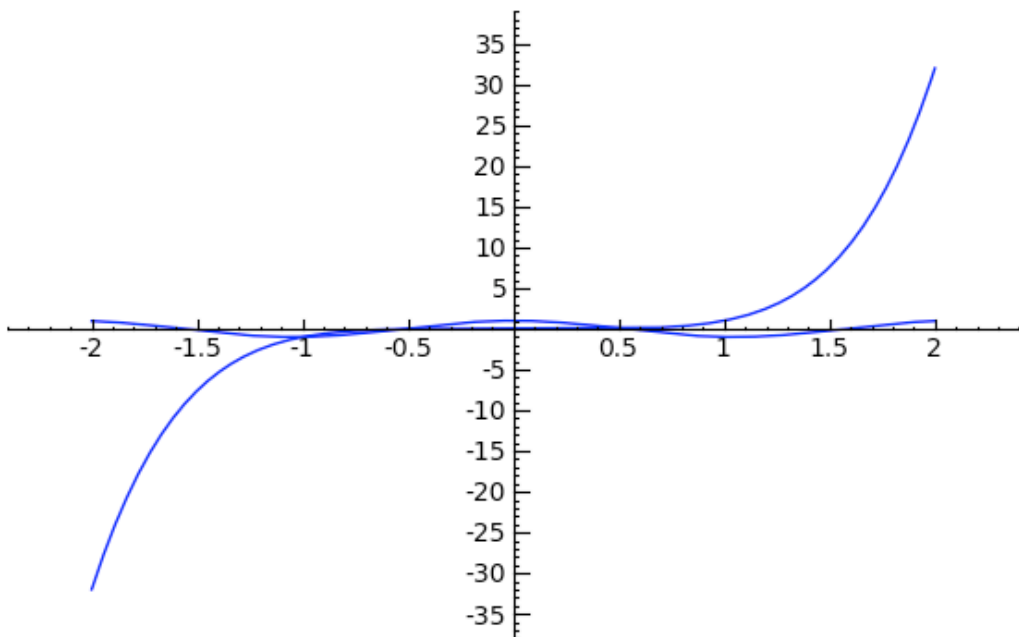
$$x = -\frac{1}{2}(-I\sqrt{3} + 1)\left(\frac{1}{18} \frac{\sqrt{27a^2d^2 + 4ac^3 - b^2c^2 - 2(9abc - 2b^3)d}\sqrt{3}}{a^2} - \frac{1}{54} \frac{(27a^2d - 9abc + 2b^3)}{a^3}\right)$$

$$x = \left(\frac{1}{18} \frac{\sqrt{27a^2d^2 + 4ac^3 - b^2c^2 - 2(9abc - 2b^3)d}\sqrt{3}}{a^2} - \frac{1}{54} \frac{(27a^2d - 9abc + 2b^3)}{a^3}\right)^{\left(\frac{1}{3}\right)} -$$

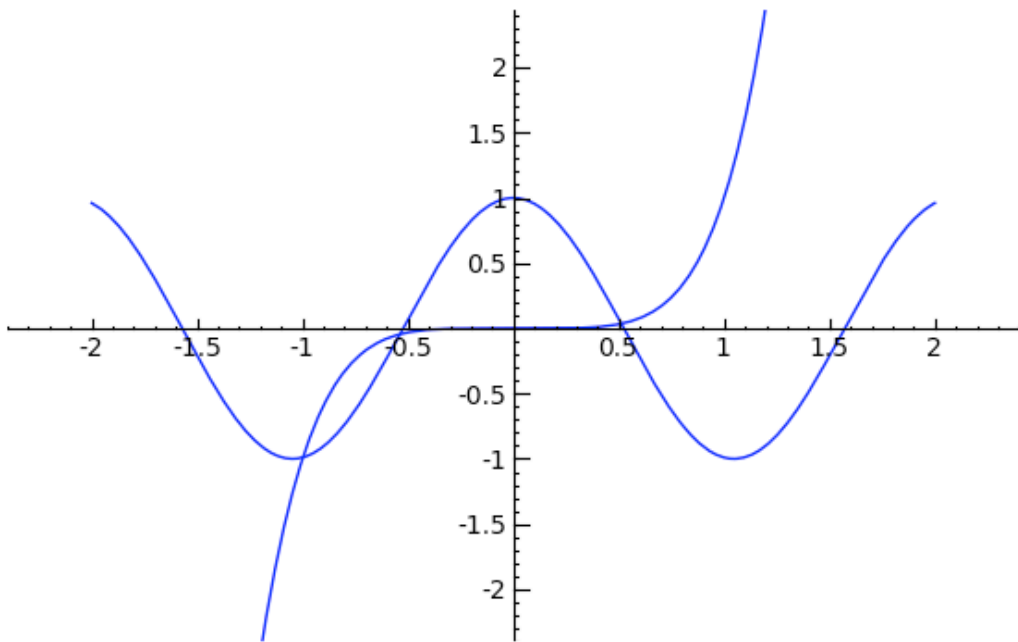
```
solve(x^5 == cos(3*x), x)
```

```
[x = r8, x = r7]
```

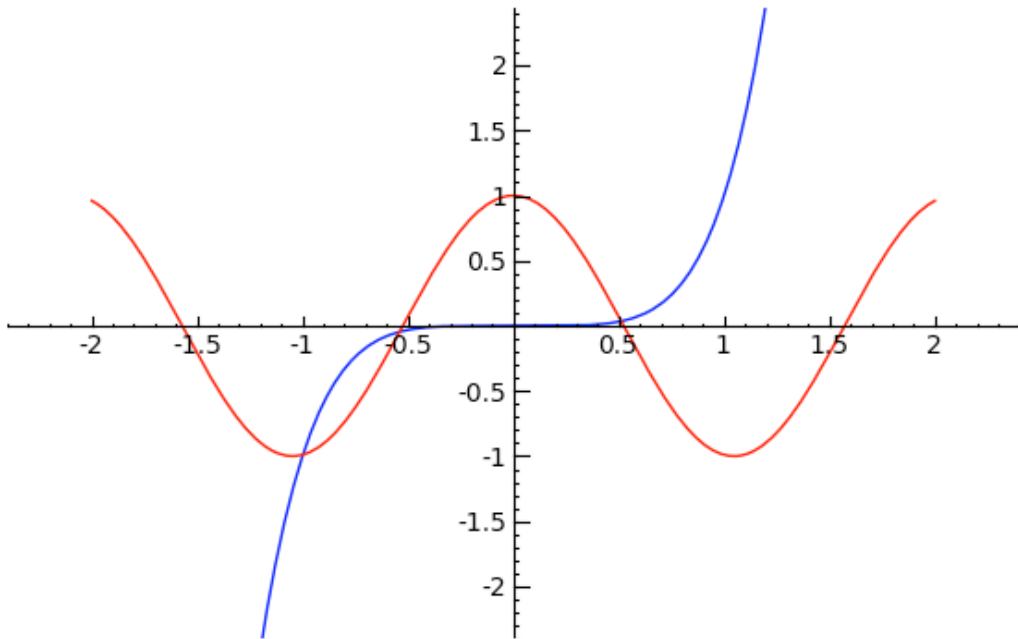
```
plot((x^5, cos(3*x)), (x, -2, 2))
```



```
show(plot((x^5, cos(3*x)), (x, -2, 2)), ymin=-2, ymax=2)
```



```
p1 = plot(x^5, (x, -2, 2), color='blue')
p2 = plot(cos(3*x), (x, -2, 2), color='red')
show(p1 + p2, ymin=-2, ymax=2)
```



```
(x^5 == cos(3*x)).find_root(-2,2)
```

0.511881773347

```
find_root(x^5 == cos(3*x), -1.5, -0.8)
```

-0.997798062493

```
(x^5 == cos(3*x)).find_root(-0.8, -0.5)
```

-0.538730390915

```
corey = sin(x)^2 + cos(x)^2
```

```
corey
```

$$\sin(x)^2 + \cos(x)^2$$

```
corey.simplify()
```

$$\sin(x)^2 + \cos(x)^2$$

```
corey.simplify_trig()
```

1

```
var('y')
```

```
xheni = (x^3-y^3)/(x^2+x-y-y^2)
```

```
xheni
```

$$\frac{(x^3-y^3)}{(x^2-y^2+x-y)}$$

```
xheni.simplify()
```

$$\frac{(x^3-y^3)}{(x^2-y^2+x-y)}$$

```
xheni.simplify_rational()
```

$$\frac{(x^2+xy+y^2)}{(x+y+1)}$$

```
xheni.numerator().factor()
```

$$(x-y)(x^2+xy+y^2)$$

```
xheni.denominator().factor()
```

$$(x-y)(x+y+1)$$

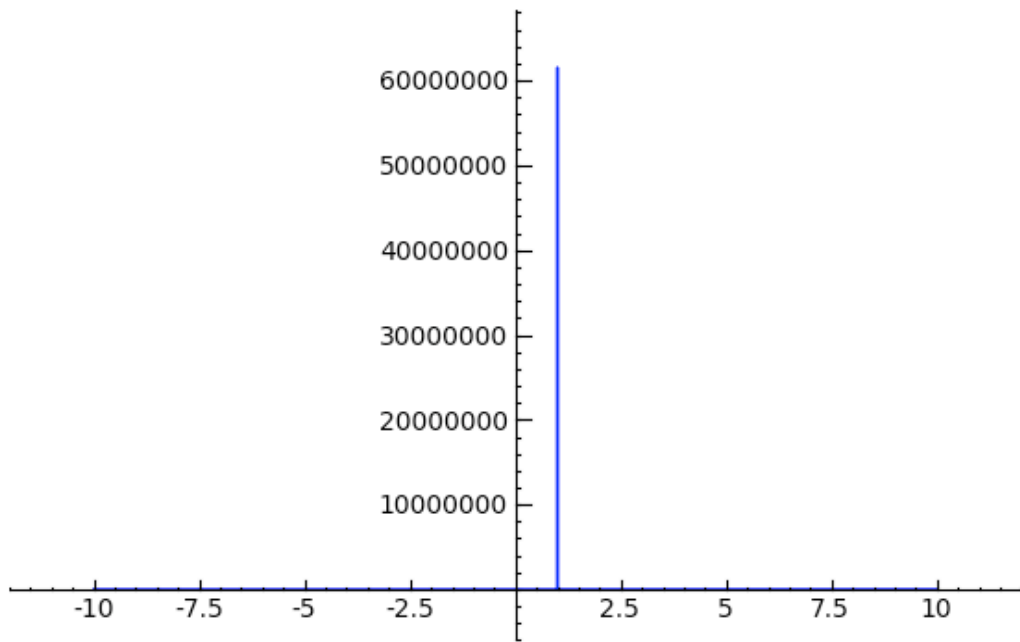
```
x^3+1/(x-1)^2-150/1+(x+3)^4
```

$$\frac{1}{(x-1)^2} + (x+3)^4 + x^3 - 150$$

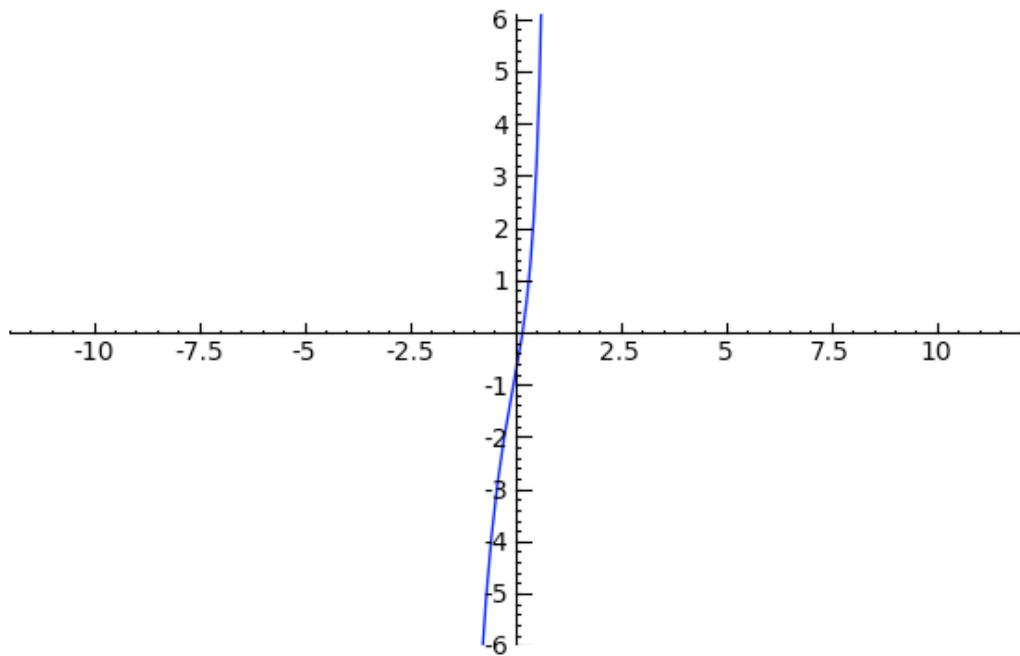
```
x^3+1/(x-1)^2-150/(1+(x+3)^4)
```

$$\frac{1}{(x-1)^2} - 150 \frac{1}{((x+3)^4+1)} + x^3$$

```
plot(x^3+1/(x-1)^2-150/(1+(x+3)^4), (x, -10, 10))
```



```
show(plot(x^3+1/(x-1)^2-150/(1+(x+3)^4), (x, -10, 10)), ymin=-5,
ymax=5)
```



```
f = x^2
f
```

$$x^2$$

```
var('h')
f.substitute(x=x+h)
```

$$(h+x)^2$$

```
_-f
```

$$(h+x)^2 - x^2$$

```
_/h
```

$$\frac{((h+x)^2 - x^2)}{h}$$

```
_.simplify_rational()
```

$$h + 2x$$

```
f.substitute(x=5)
```

25

```
g(x) = x^2
```

```
f
```

$$x^2$$

```
g
```

$$x \mapsto x^2$$

```
g(5)
```

25

```
(g(x+h)-g(x))/h
```

$$\frac{((h+x)^2 - x^2)}{h}$$

```
_.expand()
```

$$h + 2x$$

```
g(x+h).expand()
```

$$h^2 + 2hx + x^2$$

```
2^(2^0)+1
```

3

```
factor(2^(2^5)+1)
```

641 · 6700417

```
is_prime(2^(2^14)+1)
```

False

```
print(2^(2^14)+1)
```

```
11897314953572317650857593266280071307634446870965102374726748212332\  
61358180483686904488595472612039915115437484839309258897667381308687\  
42627452469834156500608087163436600489752214325161953144684595234570\  
94821358470366474648309847847142809678456141384760443384048861229052\  
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61340687520241736532395026788008906751737227061083564754575578079343\  
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65405285113556134369793281725888015908414675289832538063419234888599\  
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45938168982889944451734003646179283771380744113457918485735950771704\  
37644191743889644885377684738322240608239079061399475675334739784016\  
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```

09889260308947896046761531042572601418068230275880034419514553277015\  
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33370133854059980407019086623873016050181882625737237662792407989317\  
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25125882696968836419413394578015784436494605271365545490632718742853\  
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86862064169042458555136532055050508189891866846863799917647547291371\  
57350070101519755909745304003303152068351821649419563669607774811059\  
82849013436114692142741218104950779792755566451649838500620510665170\  
84647369464036640569339464837172183352956873912042640003611618789278\  
19571005209456276130670355184033011064510199543516762668866962776382\  
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52761297664065498347492661798824062312210409274584565587264846417650\  
16012317587403472626195728908146619765155383074442470969863475362777\  
03562271261450525491252294480401491147956813598759685128085752442718\  
71455454084894986155020794806980939215658055319165641681105966454159\  
95147690858312972150329881658514207306148088802176981833841712939687\  
83714595758460525831429284472497036985481252957759209364500226514272\  
49949580708203966082847550921891152133321048011973883636577825533325\  
98885215632543933502131531213408139045102125536370790349591696312592\  
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66132042542264642436896101074299231976386815458375617735355689845360\  
53627234424277105760924864023781629665526314910906960488073475217005\  
12113631187043992576250866603256621375041669571991967422321060672472\  
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79921539892177334344368907550318800833546852344370327089284147501640\  
58944848200125423738668007445734191093377489195968101651606910614990\  
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30000413884971588313986607154757481647672763511643546280440111271139\  
25291805707941934226868183532127990689722476971914742681579121959737\  
94192807298886952361100880264258801320928040011928153970801130741339\  
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90078034065963213534170040688694434054721406759636409974050092258035\  
05672726465095506267339268892424364561897661906898424186770491035344\  
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84996918640665905396607090695373816018876790466577596545880019371177\  
71344698326428792622894338016112445533539447087462049763409147542099\  
24881552139592938800771117201789489779370660427348098516102881545878\  
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70062881794717751811521767435201651117234772772707522005617774821892\  
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47235474636076460187244203137994413982436682869879021292299617419272\  
86258917200576125093491004825459641520464779251144465007321641090993\  
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79718883477965627347911238858570642483637907235541028678701852740165\

```
39342198883610619496719610550686869614680190356297494240865871950410\  
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26852009414679887611041458317039047398248889922809181821393428829567\  
9717369943152460447027290669964066817
```

numerator?

numerator??

xheni.n

## Other Cool Stuff

We can put text into *Sage* worksheets, too.