mathWithPython_algebra1_solve4x

April 16, 2025

1 COURSE: Master math by coding in Python

2 SECTION: Algebra 1

3 VIDEO: Solving for x

3.0.1 https://www.udemy.com/course/math-with-python/?couponCode=202312

INSTRUCTOR: Mike X Cohen (http://sincxpress.com) This code roughly matches the code shown in the live recording: variable names, order of lines, and parameter settings may be slightly different.

[ ]:
```
```

[1]:
```
# It's generally good practice to import all required modules at the top of the␣
↪script!
import sympy as sym
import numpy as np
from IPython.display import display, Math
```

[2]:
```
x = sym.symbols('x')

# the expression we want to solve is 2x+4=9
expr = 2*x + 4 -9

sym.solve(expr,x)
```

[2]:
```
[5/2]
```

[3]:
```
# make it look a bit nicer

sol = sym.solve(expr,x)

display('The solution to %s is %g'%(expr,sol[0]))

# or
display(Math('\\text{The solution to }%s\\text{ is x=}%g' %(sym.
↪latex(expr),sol[0])))
```

```
'The solution to 2*x - 5 is 2.5'
```

The solution to $2x - 5$ is x=2.5

[4]:
```
# can input the equation directly into the solve function
sym.solve(x**2 - 4,x)
```

[4]:
```
[-2, 2]
```

[5]:
```
# notice the solution is stored as a list, with one solution per element
sol = sym.solve(x**2 - 4,x)

print( type(sol) )
print( len(sol) )
```

```
<class 'list'>
2
```

[6]:
```
# we can print them all out:
for i in range(0,len(sol)):
  print('Solution #' + str(i+1) + ' is ' + str(sol[i]))
```

```
Solution #1 is -2
Solution #2 is 2
```

[7]:
```
y = sym.symbols('y')

expr = x/4 - x*y + 5

print( "Solved for x: " + str(sym.solve(expr,x)[0]) )
print( "Solved for y: " + str(sym.solve(expr,y)) )
```

```
Solved for x: 20/(4*y - 1)
Solved for y: [(x + 20)/(4*x)]
```

[ ]:
```

```

4 Exercises

[8]:
```
# 1)
# simplify and solve for q
q = sym.symbols('q')
eq = 3*q + 4/q + 3 - 5*q - 1/q - 1

display(Math(sym.latex(eq.simplify())))
display(Math('q='+sym.latex(sym.solve(eq,q))))
```

$-2q + 2 + \frac{3}{q}$

$$q = \left[\frac{1}{2} - \frac{\sqrt{7}}{2},\ \frac{1}{2} + \frac{\sqrt{7}}{2}\right]$$

[9]:
```
# 2)
eq = 2*q + 3*q**2 - 5/q - 4/q**3

display(Math(sym.latex(eq)))
display(Math(sym.latex(sym.simplify(eq))))
display(Math(sym.latex(sym.cancel(eq)))) # puts into p/q form with integer␣
 ↪coefficients
```

$$3q^2 + 2q - \frac{5}{q} - \frac{4}{q^3}$$

$$3q^2 + 2q - \frac{5}{q} - \frac{4}{q^3}$$

$$\frac{3q^5 + 2q^4 - 5q^2 - 4}{q^3}$$

[10]:
```
# 3)
# simplify this expression. confirm on your own using paper-and-pencil
expr = (sym.sqrt(3) + sym.sqrt(15)*q) / (sym.sqrt(2) + sym.sqrt(10)*q)
display(Math(sym.latex(expr)))
display(Math(sym.latex(sym.simplify(expr))))
```

$$\frac{\sqrt{15}q + \sqrt{3}}{\sqrt{10}q + \sqrt{2}}$$

$$\frac{\sqrt{6}}{2}$$

[11]:
```
sym.simplify( expr.subs(q,10) )
```

[11]:
$$\frac{\sqrt{6}}{2}$$

[12]:
```
expr.subs(q,10).evalf()
```

[12]:
1.22474487139159

[ ]:
```

```