

Week9 : Symbolic Programming

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Q1

Calculate the expanded form of $(x+y)^6$

In [8]:

```
1 from sympy import *
2
3 x, y = symbols('x y')
4 exp = (x+y)**6
5 expanded = expand(exp)
6
7 print('Original expression: ')
8 print(exp)
9 print()
10
11 print('Expanded form: ')
12 print(expanded)
```

Original expression:

$(x + y)^6$

Expanded form:

$x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$

Q2

Simplify the trigonometric expression $\sin(x)/\cos(x)$

In [10]:

```
1 from sympy import *
2
3 exp = sin(x) / cos(x)
4
5 print('Original expression: ')
6 print(exp)
7 print()
8
9 print('Simplified form: ')
10 print(simplify(exp))
```

Original expression:

$\sin(x)/\cos(x)$

Simplified form:

$\tan(x)$

Q3

Calculate $\sqrt{2}$ with 100 decimals.

In [15]:

```
1 from sympy import *
2
3 print('Root 2 with upto 100 decimal places:')
4 print(N(sqrt(2), 100))
```

Root 2 with upto 100 decimal places:

1.41421356237309504880168872420969807856967187537694807317667973799073247846
2107038850387534327641573

Q4

Calculate $\frac{1}{2} + \frac{1}{3}$ in rational arithmetic.

In [19]:

```
1 from sympy import *
2
3 a = Rational(1,2)
4 b = Rational(1,3)
5 print('1/2 + 1/3 =', a+b)
```

$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

Q5

Solve the system of equations : $x+y=2$, $2x+y=0$

In [24]:

```
1 from sympy import *
2
3 x, y = symbols('x y')
4
5 eq1 = Eq(x + y - 2)
6 eq2 = Eq(2*x + y)
7
8 print('Eq1: x+y=2')
9 print('Eq2: 2*x+y=0')
10 print('Soln:', solve((eq1,eq2), (x, y)))
```

Eq1: $x+y=2$

Eq2: $2x+y=0$

Soln: $\{x: -2, y: 4\}$