

# Applications of mathematical theories - Lagrange interpolation, Bezier curves and Multivariate division algebras

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## 1 Lagrange interpolation

To run the program, open up the terminal and type:

```
python3 [path/to/lagrange-interpolation.py]
```

Action	Description
[LMB] <sup>1</sup> click	Adding a new point in the current cursor position
[RMB] <sup>2</sup> click	Removing a point in the current cursor position

Table 1: Program specification

By using this program, you can add or remove points with your mouse and the program will display the lagrange interpolation according to your points.

**Note:** You can check the gif file(lagrange-interpolation.gif) inside the project folder to see an example of the running program.

## 2 Bezier curves

To run the program, open the terminal and type:

```
python3 [path/to/bezier-curve.py]
```

Action	Description
[LMB] click	Adding a new point in the current cursor position
[RMB] click	Removing a point in the current cursor position
[Key_D] <sup>3</sup> press	Dragging/Dropping a point located in the current cursor position

Table 2: Program specification

By using this program, you can add, remove or drag/drop points and the program will display the bezier curve. Note that, each time you add/remove/modify any point the curve is affected globally.

**Note:** You can check the gif file(beizer-curves.gif) inside the project folder to see an example of the running program.

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<sup>1</sup>Left Mouse Button

<sup>2</sup>Right Mouse Button

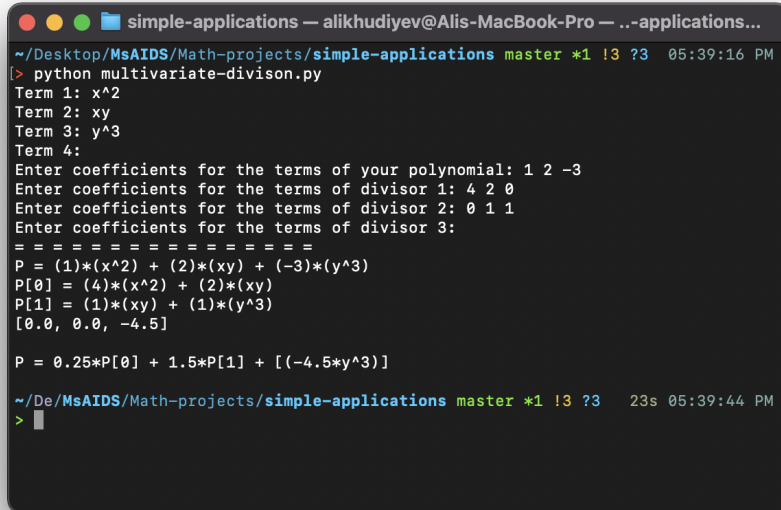
<sup>3</sup>the character 'D' on a keyboard

### 3 Multivariate division algebras

To run the program, open up the terminal and type:

```
python3 [path/to/multivariate-division.py]
```

The program will ask you to enter all the terms that you are going to use in your polynomials <sup>4</sup>. After entering the terms one by one, you can just hit enter to start writing down your polynomial. To do it, the program will ask you to enter the coefficient of each term(that you entered before) and you will need to enter them by the order which the terms are listed. The next stage is to enter the divisor(s). You have to enter your divisor(s) as the way you add your polynomial.



```
~/Desktop/MsAIDS/Math-projects/simple-applications master *1 !3 ?3 05:39:16 PM
[> python multivariate-divison.py
Term 1: x^2
Term 2: xy
Term 3: y^3
Term 4:
Enter coefficients for the terms of your polynomial: 1 2 -3
Enter coefficients for the terms of divisor 1: 4 2 0
Enter coefficients for the terms of divisor 2: 0 1 1
Enter coefficients for the terms of divisor 3:
=====
P = (1)*(x^2) + (2)*(xy) + (-3)*(y^3)
P[0] = (4)*(x^2) + (2)*(xy)
P[1] = (1)*(xy) + (1)*(y^3)
[0.0, 0.0, -4.5]

P = 0.25*P[0] + 1.5*P[1] + [(-4.5*y^3)]

~/De/MsAIDS/Math-projects/simple-applications master *1 !3 ?3 23s 05:39:44 PM
> █
```

Figure 1: Example of the running program

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<sup>4</sup>You also need to include the ones which are going to be used in your divisor(s)