

MA061 Exercises 4: Mathematica (further)

Notes on Mathematica will be at <http://www.maths.tcd.ie/~richardt/MA061>
Generate a Mathematica notebook with the solutions to the following problems and save as `ex4.nb`.

Send in your work electronically by using the program `submit-work` to send in the file `ex4.nb`. Submit under MA061:4.

1. Make a parametric plot of the curve

$$\begin{aligned}x &= 3 \cos t \\y &= 3 \sin t \quad (0 \leq t \leq 7\pi/4)\end{aligned}$$

2. Define a quantity u to be 1.51 and calculate $u^2 + 33u - 47$
3. Define a quantity v to be $x^2 + 1$ and calculate v^9 . Get Mathematica to expand out the answer.
4. Define a new function $f(x) = a_3x^7 + a_4x^6 + a_5x^5$ where a_3 is the third digit of your student ID number (counting from the left), a_4 is the fourth digit and a_5 is the fifth digit.

Check that your function is working right by finding first $f(t)$ and then $f(1.2)$. [If you did not do it right, then $f(t)$ will not turn out as $a_3t^7 + a_4t^6 + a_5t^5$ and $f(1.2)$ won't be a number.]

5. Plot the graph of the function $f(x)$ defined above for $-3 \leq x \leq 3$.
6. Find the derivative of the same function $f(x)$.
7. Use the `Integrate[]` command of Mathematica to find an antiderivative for $f(x)$.
8. Use the `Sum[]` command to calculate $\sum_{n=1}^{10} n^4 + n$.
9. Define matrices A and B so that

$$A = \begin{bmatrix} 1 & c & 4 \\ c & 2 & -1 \\ 3 & 0 & 5 \end{bmatrix}, \quad B = \begin{bmatrix} 2 & -6 & c \\ -7 & 2 & -c \\ c & 10 & 9 \end{bmatrix}$$

and compute (i) the products AB and BA (ii) the difference $AB - BA$ and (iii) the determinant $\det A$.

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