1- a) Define the following function using `syms`:

$$f(x) = x^2 e^x - 5x^3.$$

b) Compute the integral, and the first and second derivatives of the above function symbolically.

c) Define the following function using `syms`:

$$f(x, y, z) = x^2 e^y - 5z^2.$$

Compute the integral with respect to x and second derivative with respect to z.

2- Look for the command window, and use it as a calculator:

(a) •

$$\frac{3\sqrt{3}}{4} + 24\left(\frac{1}{12} - \frac{1}{5\cdot 2^5} - \frac{1}{28\cdot 2^7} - \frac{1}{72\cdot 2^9}\right).$$

(b)

$$3 + \frac{1}{60}\left(8 + \frac{2\cdot 3}{7\cdot 8\cdot 3}\left(13 + \frac{3\cdot 5}{10\cdot 11\cdot 3}\left(18 + \frac{4\cdot 7}{13\cdot 14\cdot 3}(23 + \ldots)\right)\right)\right).$$

3- Use one MATLAB line to evaluate the expression below:

$$\sqrt{\frac{(4.172 + 9.131844)^3 - 18}{-3.5 + (11.2 - 4.6) * (7 - 2.91683)^{-0.4}}}$$

4. Evaluate the following expression:

$$\left(6 \begin{bmatrix} 10 & -7 & 6 & -9 \\ 0 & -1 & 10 & 7 \\ 7 & 9 & 4 & 9 \end{bmatrix} - 8 \begin{bmatrix} 4 & -2 & 5 & -9 \\ 6 & 4 & -9 & -8 \\ 5 & -6 & -4 & 7 \end{bmatrix} \right) \times \begin{bmatrix} 5 & 4 & -7 & -3 \\ 6 & 4 & 0 & 2 \\ -4 & -6 & 10 & -5 \end{bmatrix}^T$$

5. Create a matrix of 100 rows and 100 columns. The odd columns should contain values 2, and the even columns, values 0.

6. Using a matrix equation, find the intersection point of the lines defined by the following equations:

$$\begin{aligned} 7x - 12y + 4 &= 0 \\ 12x - 45y + 26 &= 0 \end{aligned}$$

Find and display all integers between 1 and 10000 which divide by 37. Propose at least two different ways to solve this problem.

7. Ask the user to input an integer in the range from 10 to 500. (Look up and use the `input` command.) If the input number is not an integer or is outside the limits, keep asking for a new number. Store the number in a variable *N*.

8. Create a new function, that multiply 2 numbers, and use it

9_. Create a function that check if a number is above or bellow 1814

10_. Create a function that receives a vector and display all the elements of this vector

11_. Plot the bell-shaped function f(x), x range [0,1], varying α in [1.5, 2, 4, 9]

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f(x) = 4^α * x^(α - 1) * (1 - x)^(α - 1)
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