

**Lab exercises**  
**degree in mechanical engineering**  
**AY 2016-17**

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$\pi$ -day

Solve the following problems in Matlab

1. Compute  $a^2 - b^2$  with  $a = 1.4 \cdot 10^{154}$  and  $b = 1.3 \cdot 10^{154}$ . What do you see? How to solve the problem in a stable way?
2. Let  $x = 8.88178419700125 \cdot 10^{-16}$ . Compute the expression

$$\frac{(1+x) - 1}{x}.$$

Why the result is more accurate of taking  $x = 8.0 \cdot 10^{-16}$ ?

3. Write the Matlab code that computes the expression

$$f(x) = \frac{e^x - 1}{x}$$

when  $x$  assumes the values

`x=[0.2, 1.e-1, 1.e-2, 1.e-5, 1.e-6, 1.e-10, 1.e-15, 1.e-16];`

4. Write the Matlab code that computes the *machine precision*, `eps`.

Time: **2 hours**.