# Errors

1) "Experimental"
Particularly for simulations, where we average over an ensemble of "runs",

2) - arising from cutting off a Taylor series expansion

3) - only a finite set of real numbers are exactly represented on a computer

single precision -
sign exponent hidden mantissa

mantissa $m$: $1 \leq m < 2$

The $24^{th}$ bicemal can't be stored!

BTW: Biggest number is

$2^{128} = 10^{x} \rightarrow$

Machine epsilon

Adding $2^{-24}$ to $1.\underbrace{000\ldots000}_{23 \text{ bicemals}}$ yields

$2^{-24} \approx$

is called machine epsilon $\epsilon_M$

$\epsilon_M$ - biggest number you can add to unity with the result
- also called

A number $1.b_1 b_2 \ldots$ can not be specified

For double precision (64 bits), mantissa is

$1.b_1 b_2 \ldots$ ,

A real number $x$ is rounded to $\bar{x}$

$\bar{x} =$

with $|\epsilon|$

Subtraction :

$res = x_1 - x_2$

Numerical Calculus -

Differentiation

recall $f(x+h) =$

solve for $f'(x) =$

as $h$ becomes small,

so we can write forward difference formula

$f'(x) =$

Error $\sim h$ implies