Tutorial 01 04/08/2022

Possible steps involved in plotting function $f(x)$.

1) determine the domain
2) look for symmetry (even and odd etc...)
3) Interesting points
   (a) zeros of function
   (b) value at $0, \infty, -\infty$ etc
   (c) look for infinities of function

(d) function taking $\frac{0}{0}$

or $\frac{\infty}{\infty}$

This should able of fix the scale and important point

(e) maxima, minima, other extremas

(f) look of behaviour such as increasing decrease between interesting points

Smoothly plot !

(a) $\sin x$

domain $-\infty, \infty$

function is periodic $[-\pi, \pi]$

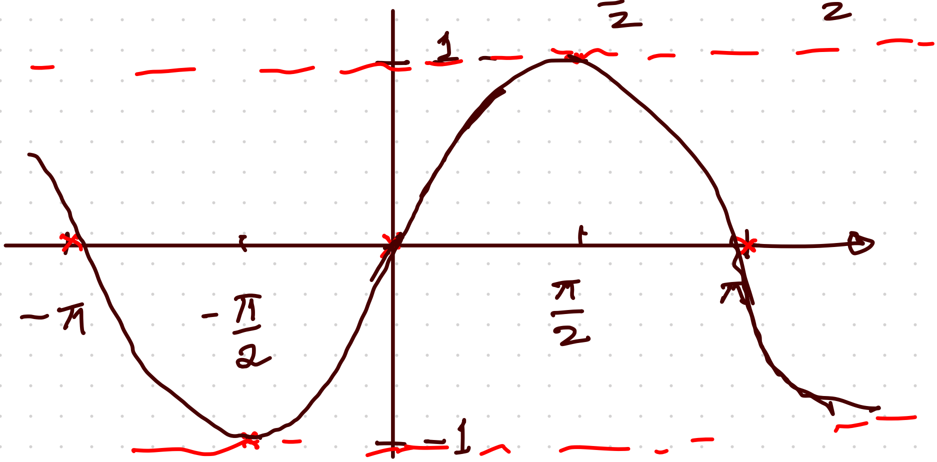
function is odd.

function has zeros

at $n\pi \to n$ integer

maxima at $\frac{\pi}{2}$ and $-\frac{\pi}{2}$

minima at $\frac{3\pi}{2}$ and $-\frac{3\pi}{2}$



$$\frac{dy}{dx} = -\cos x$$

(b) $f(x) = e^x$

domain $(-\infty, \infty)$

Symmetry non-

all +ve function

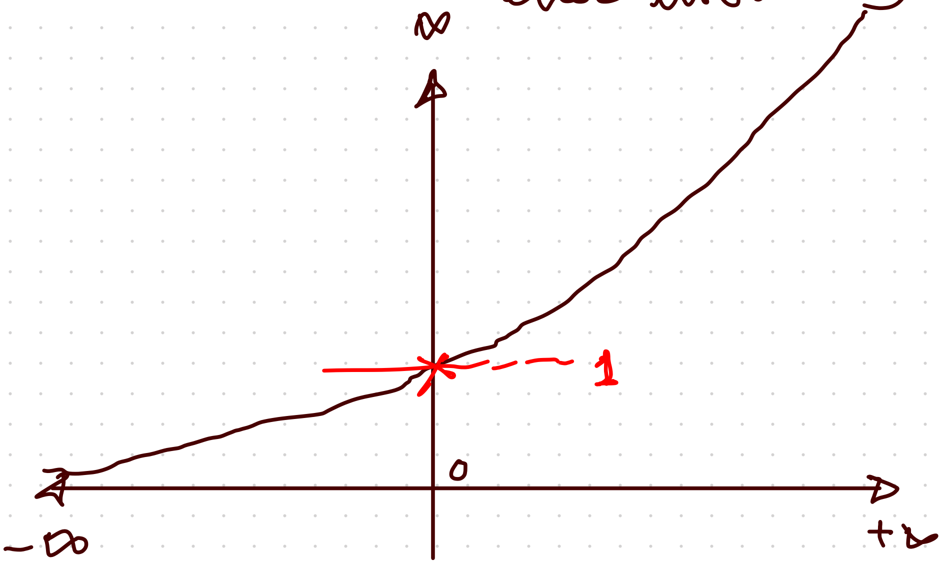
at $-\infty \longrightarrow f(x) \to 0$

at $+\infty$, $f(x) \longrightarrow \infty$

at 0, $f(x) = 1$

$\frac{dy}{dx} = e^x$ also +ve and

ever increasing



ⓒ $f(x) = e^{-x^2}$ (gaussian)

domain $(-\infty, \infty)$

symmetry: even function

at $-\infty$ $f(x) \to 0$

at $+\infty$ $f(x) \to 0$

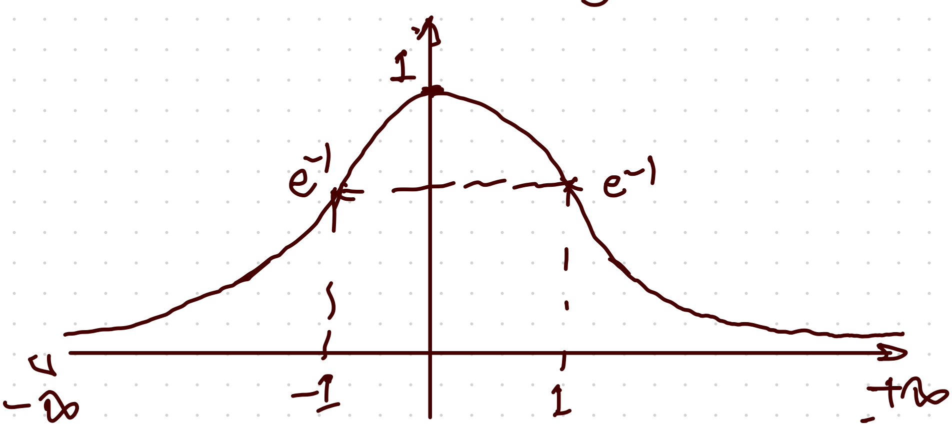
at $x = 0$ $f(x) = 1$

$$\frac{dy}{dx} = -e^{-x^2} 2x$$

at $x = 0$ $\frac{dy}{dx} = 0$

function increasing $-ve$ x

decreasing $+ve$ x.



(d) $f(x) = \ln x$

Domain $(0, \infty)$

$-\infty$ at $x = 0$

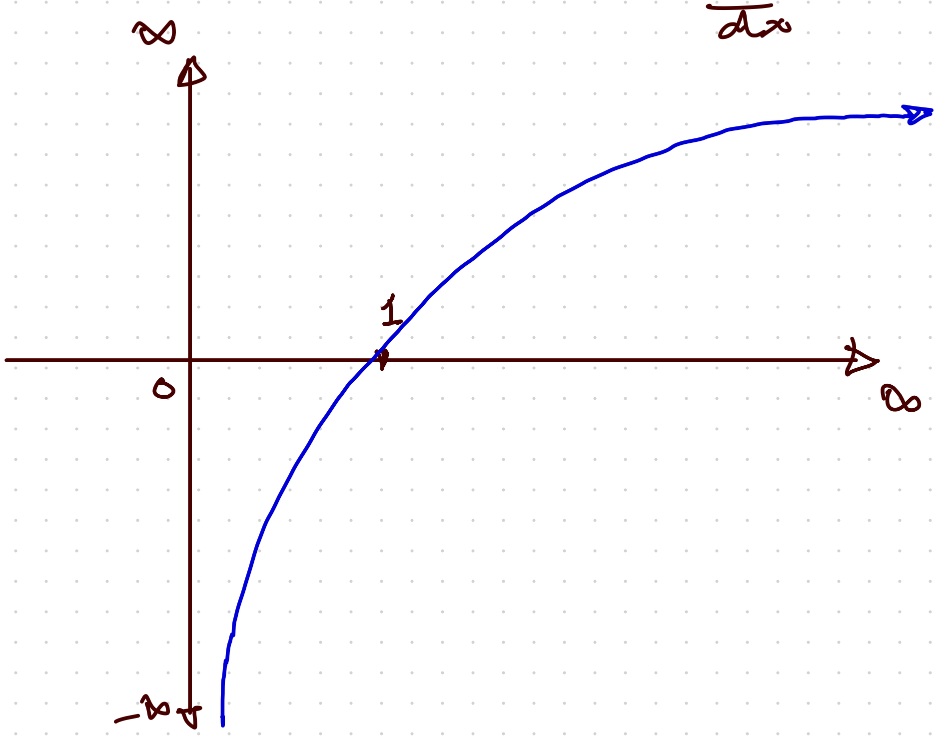
0 at $x = 1$

∞ at $x = \infty$

$\frac{dy}{dx} = \frac{1}{x}$ increasing rapidly

in 0 ~~to~~ 1 and slows at x

increases at $x = \infty$ $\frac{dy}{dx} = 0$



(e) $f(x) = x,\ x^2,\ x^3,\ x^4$

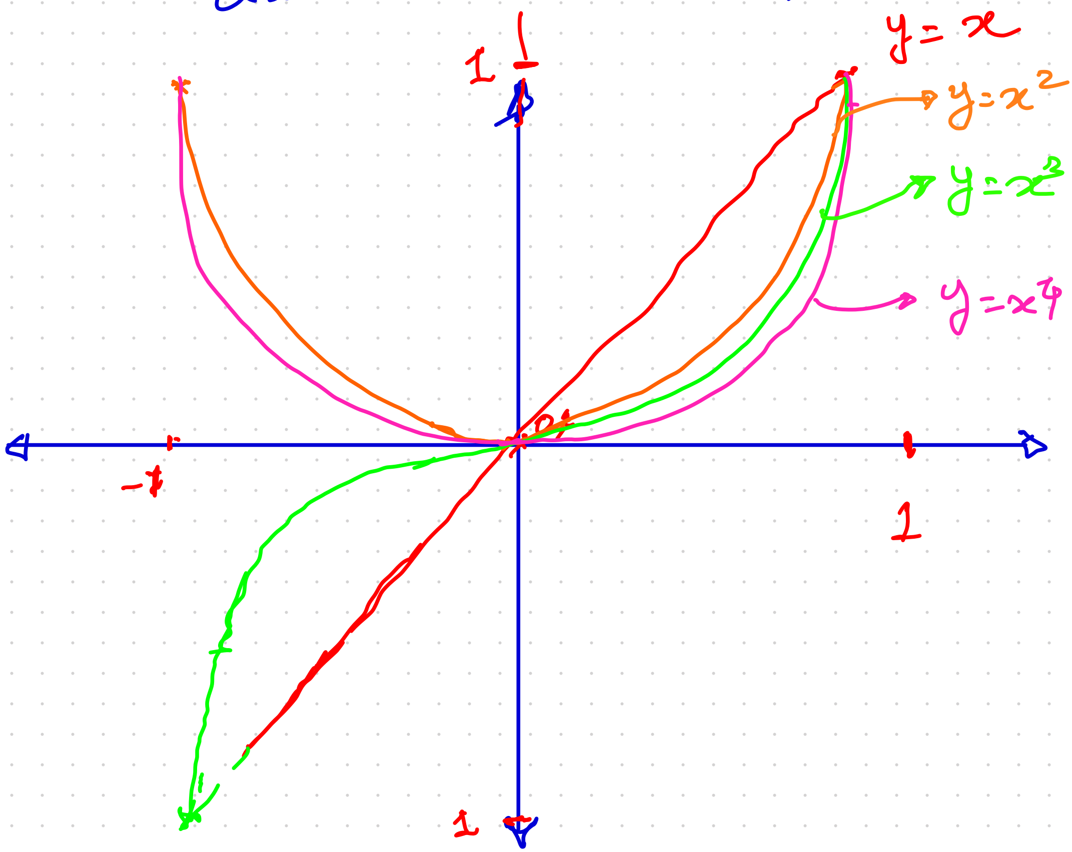
domain $-\infty, \infty$

n odd function is odd

n even function is even

$f(x) = 0$

$\frac{dy}{dx} = 1,\ 2x,\ 3x^2,\ 4x^3$



(f) $f(x) = \frac{\sin x}{x}$

Domain $(-\infty, \infty)$

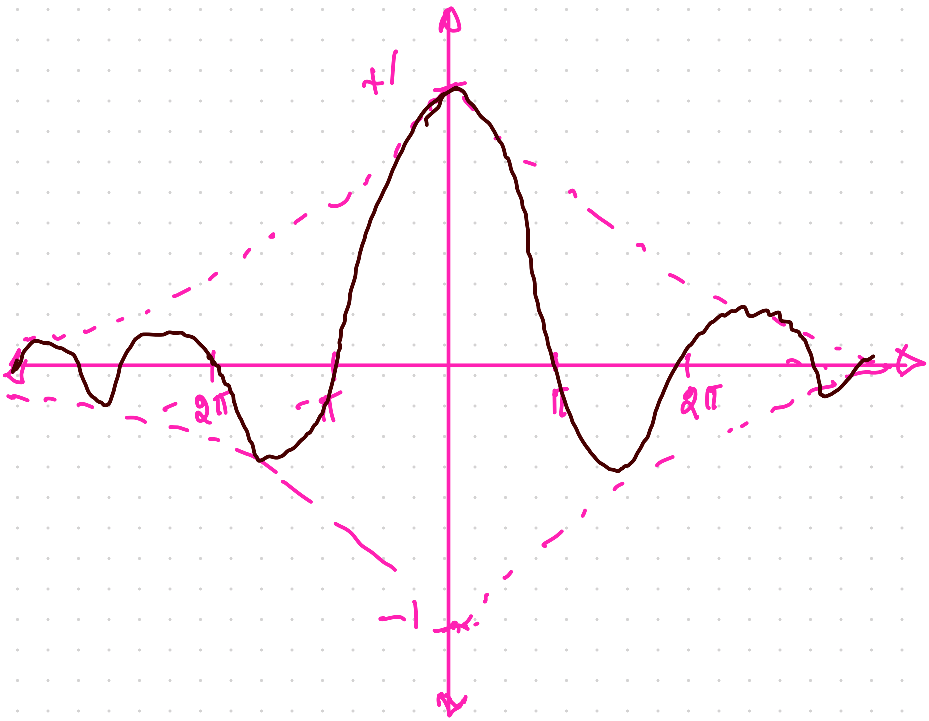
zero at $-\infty$ and $+\infty$

at $x = 0$ $\frac{0}{0}$ form

to evaluate diff. $\frac{\cos x}{1} \to 1$ as $x \to 0$

Amplitude goes down as $\frac{1}{x}$

zeros at $n\pi$



⑥ $f(x) = x\log x$ or $x\ln x$

Domain $(0, \infty)$

at ∞, $f(x) \to \infty$

at $x = 1$ $f(x) = 0$

at $x = 0$ $\frac{0}{\infty}$ or we can

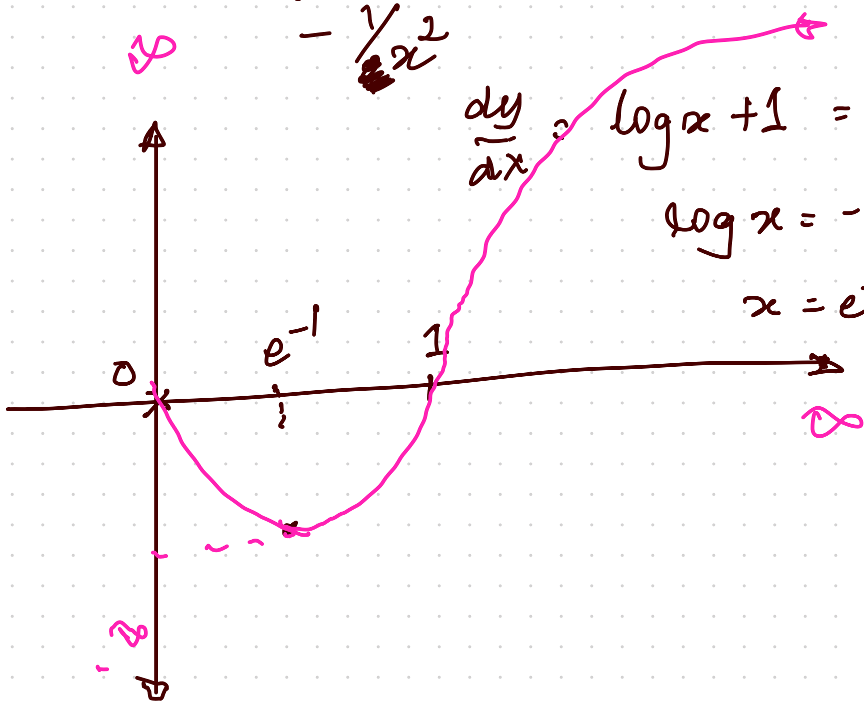
write as $\frac{\log x}{1/x} = \frac{-\infty}{\infty}$ form

diff: $\frac{\frac{1}{x}}{-1/x^2} \to 0$ at $x \to 0$

$\frac{dy}{dx} = \log x + 1 = 0$

$\log x = -1$

$x = e^{-1}$



(*) Last three are to be done ?