Test 1

Tuesday 30 sept.2025

Maths IB_2 HL

Subjects : *derivatives, implicit derivation ...*

Name:_____

Total : / 20

Problem 1 [/12 marks]

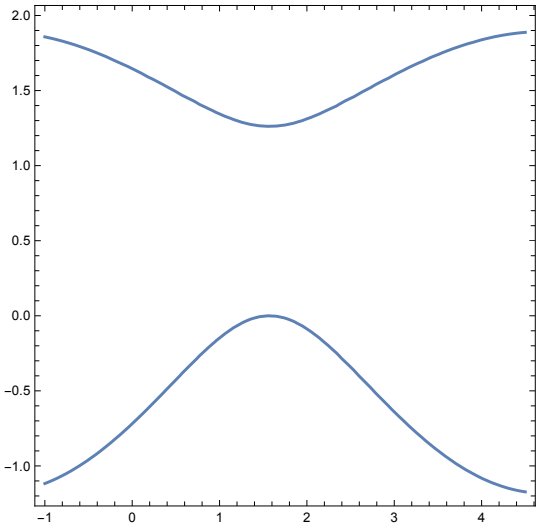
A curve $\mathcal{C}$ is defined implicitly by the equation $e^{\sin(y)} = \sin(x) + y^2$.

(a) Find the equation of the *tangent* to C at the point P where $y = 0$ and $0 < x < \pi$.

(b) Find the equation of the *normal* to C at the point P.

(c) Find the second derivative at the point P.

(d) The image below shows a part of $\mathcal{C}$



Show the point P on the same picture, and the two lines (the tangent and the normal at $\mathcal{C}$).

(e) Show that the curve in "concave-up" at P

Problem 2 [/4 marks]

Given that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{ky - x^2}{y^2 - kx}$, $k > 0$ when $x^3 + y^3 - 6xy = 0$, find the value of k.

Problem 3 [/7 marks]

Given that $xy = \cot(xy)$ and that derivative $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ can be written in the form $\dfrac{\mathrm{d}y}{\mathrm{d}x} = k\dfrac{y}{x}$, $k \in \mathbb{Z}$. Calculate the value of k.