Q1]... In this question we will analyze the *asteroid* parametric curve

\[ x = \cos^3 t \quad y = \sin^3 t. \]

You will be asked to draw a picture of this curve on the next page.

(a) Compute \( \frac{dy}{dx} \) and \( \frac{d^2 y}{dx^2} \).

(b) Say where this curve is increasing/decreasing, and where it is concave up/concave down. Also, find the points where this curve has horizontal or vertical tangent directions.

Sketch a picture of the asteroid curve.

Q2]... Compute the length of the following parametric curve

\[ x = \sin^2 t \quad y = 2 \cos t \quad 0 \leq t \leq \pi/2 \]

[You may need to look up a table of integrals here]

Q3]... Use the Binomial Series to help you find a power series (in \( x \)) for the function \( f(x) = (8 - x^2)^{1/3} \).

What is the radius of convergence of the resulting series?

Q4]... Compute the Taylor series for \( \ln(x) \) about the point 2.

What is the radius of convergence of this series?

What does setting \( x = 1 \) in this series tell you about \( \ln 2 \)?