

MAT1841 Continuous Mathematics for Computer Science  
(Semester 2, 2016)

**Assignment 2**

This is the second of three assignments worth 10% each. It is to be submitted to your support class instructor in your support class in the week beginning 12 September (week 8 of semester). All assignments must have a signed and dated assignment cover sheet attached. A late penalty of 10% of the total possible mark per day will apply for late work. All late work is to be handed directly to the Unit Coordinator (Daniel McInnes, Room 453, 9 Rainforest Walk).

Show all working. You are being marked on your ability to clearly explain your steps in both English and mathematical statements as appropriate. Writing an answer only will not attract full marks for that question (or part thereof).

**Question 1** [10 marks] Compute the following derivatives by the method stated:

(a) Differentiate

$$f(x) = \frac{1}{\sqrt{x+1}}$$

from *first principles*.

(b) Differentiate

$$g(x) = \frac{\cos(\sin(e^x))}{2x+1}$$

by the *quotient rule*.

(c) Find

$$\frac{d^2}{dx^2} \left( \frac{\ln(\sin(e^x))}{\ln(2x+1)} \right).$$

**Question 2** [10 marks] Find the absolute maximum and the absolute minimum of the function

$$f(x) = \frac{2x+1}{x^2+1}.$$

Ensure you check all candidate points, showing the use of the first or second derivative tests or limits as appropriate, and give the function values at these points.

**Question 3** [10 marks] The folium of Descartes has the graph shown in Figure 1 and the cartesian equation

$$x^3 + y^3 = 3xy.$$

(a) Use the substitution  $y/x = t$  to find the parametric equation of the folium.

(b) Find  $\frac{dy}{dx}$  using the result of (a).

(c) Find the equation of the tangent line to the folium when  $t = 1$ .

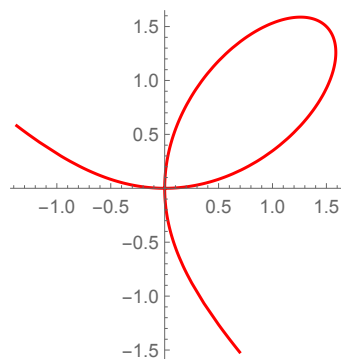


Figure 1: The folium of Descartes