

EXAM OF CALCULUS

Pharmacy/Biotechnology 1st year

Version A

February 8, 2021

Name:

DNI:

Group:

Duration: 1 hour.

- (3.5 pts.) 1. The amount of snow (in cm) that fell in Madrid during the last storm can be measured with the function

$$f(x, y) = \frac{xy}{x^2 + y^2},$$

where x represents the east component and y represents the north component of the region, both in meters.

- (a) A skier is at the point $P = (0, 1)$. What is the rate of change in the amount of snow if it moves south?
- (b) In which direction should the skier move if he wants the amount of snow to increase as quickly as possible? How much does the amount of snow increase in that direction?
- (c) Another skier observes that if he moves west the amount of snow does not change. At what points can this skier be if he knows that his north component is $y = 1$?

- (3 pts.) 2. The Periodic Fever, Aphthous Stomatitis, Pharyngitis, Adenitis syndrome (PFAPA) causes repeated episodes of fever lasting from 3 to 6 days. For a patient the temperature in one of the episodes of fever is given by the function

$$T(x) = 36.5 + e^{\frac{-(x-2)^2}{2}},$$

where T is the temperature and x is the number of days from the beginning of the episode of fever.

- (a) What is the maximum temperature that the patient will reach?
- (b) Using the derivative, approximate the variation of the temperature one day after the beginning of the episode of fever.

- (3.5 pts.) 3. The evolution of a fungi culture satisfies the equation $y\sqrt{2t}dy - 2y^2dt = 0$, where y is the amount of fungi at each instant t in hours. If there were 10 fungi at the beginning of the culture,

- (a) How many fungi will there be after two hours?
- (b) When will there be 1000 fungi in the culture?