EXAM OF CALCULUS

Pharmacy/Biotechnology 1st year — Version A — **February 8, 2021**

Duration: 1 hour.

(3.5 pts.) 1. The amount of snow (in cm) that felt 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 $y = 1$?

Solution

(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 temperarute 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 begining 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 benining of the episode of fever.

Solution

(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?

Solution
