

EXAM OF CALCULUS**Pharmacy/Biotechnology 1st year****Version B****February 4, 2022**

Name:

DNI:

Group:

Duration: 1 hour.

- (3.5 pts.) 1. The temperature of a gel depends on time according to the function $T(x) = x^2 + \ln(1.5 - x)$, where T is the temperature in degrees Celsius and x is the time in hours.
- (a) Compute the minimum and maximum temperature of the gel in the interval from 0 to 1.5 hours?
 - (b) How fast is the temperature changing at 1.2 hours? Compute approximately the value of the temperature 5 minutes after using the tangent line.
 - (c) At what time is the rate of change of temperature maximum?
- (3 pts.) 2. A dialysis machine works under the principle of Fick's Law, which states that the amount of waste material that passes through a membrane is proportional to the difference between the concentration of one side and the other of it. At the start of dialysis, the waste material concentration of a patient is 160 mg/dl and after 1 hour it drops to half, while the dialysate solution at the other side of the membrane remains at a constant concentration of 10 mg/dl. If dialysis finish when the patient reaches a concentration of 20 mg/dl, how long will the patient have to be on dialysis to get it?
- (3.5 pts.) 3. In a pharmacy, the amount of paracetamol Q demanded by customers depends on the price of paracetamol p and the price of ibuprofen b , according to the function

$$Q(p, b) = \frac{6b}{(p-1)p}$$

- (a) For which values of p and b this function make sense in this context?
- (b) If the price of paracetamol increases, will the demand for paracetamol increase or decrease?
- (c) If the prices of paracetamol and ibuprofen are $p = 2$ and $b = 1$ €, how should the prices of paracetamol and ibuprofen vary so that the quantity demanded of paracetamol increases as much as possible?
- (d) Assuming the same prices as in the previous question, how much will the quantity of paracetamol demanded change if the price of paracetamol increases half of ibuprofen price increase?