QUIZ 19 – MATH IB HL

1. (47%) Given the function $f(x) = -\log_2(4 - \frac{x}{3}) - 1$

   a. (8%) Find the domain of the function: _____

   b. (8%) Write all the corresponding limit(s) (if any) **and conclusion**:

   Since _____

   c. (5%) Find the y intercept: _____

   d. (8%) Find the x intercept: _____

   e. (5%) Sketch the function (including asymptotes and intercepts)

   f. (2%) State the range of the function:_____

   g. (3%) State the interval in which the function

   increases:_____

   h. (4%) Sketch the function: $g(x) = \left(Log_2(4 - \frac{x}{3}) - 1 \right)\left(\frac{x+12}{x+12} \right)$

   i. (4%) $Lim_{x \to -12^-}(g(x)) =$

2. (28%) The Weber – Fechner Law in psychophysics for the response of the human eye to stimulus follows the flowing model:

$$P(S) = A \log_9 \left(\frac{S}{S_0} \right)$$

https://en.wikipedia.org/wiki/Weber%E2%80%93Fechner_law

Where **S** is the stimulus Intensity, **A**, S_0 are constants and **P** is the **human perception** of the stimulus.

a. (4%) If **S = 3S_0**, Find the value of P.

b. (4%) Explain what does the value S_0 represent?

c. (4%) What will be the consequence of **S < S_0** ?

d. (4%) If **P(27S_0) = 5**, Find the value of A.

e. (6%) For a certain stimulus A = 2 and P = –1, this means that

   S is _____ times bigger/smaller than S_0 (Fill the blank and circle the right

   Answer, show work)

f. (6%) How much bigger is P(27S_0) of P(3S_0)?

3. (25%) It is known that a certain Athlete during his training runs a certain distance in 3 seconds in week 1 of the training. After 2 <u>more</u> weeks of training the athlete runs the same distance in 2 seconds. It is known that the athlete performance follows a logarithmic model.

    a. (5%) Create a graph, indicate all the variables on the graph and relevant points.
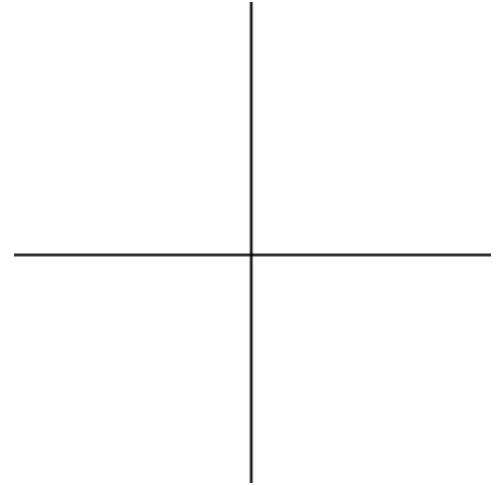
    b. (15%) Create a logarithmic model **in base 2** to describe the performance of the athlete.

    c. (5%) Comment on the limitations of the model.