5/27/24 Name ____________________________ APID _____________

US24 MTH 124 Activity 2 (2.3/3.1/3.2/3.3) (ALL WORK REQUIRED)

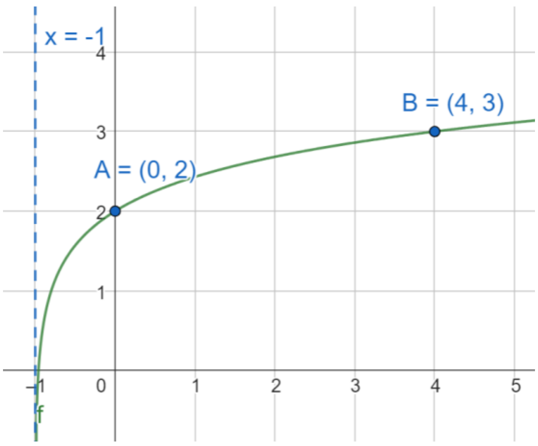
Note: (1) If you think the answer doesn't exist, just demonstrate your work and write "DNE" or "doesn't exist".

(2) Each question is worth 5 points. And the final score will be rescaled to the total 20 points and then rounded to 2 decimal place.

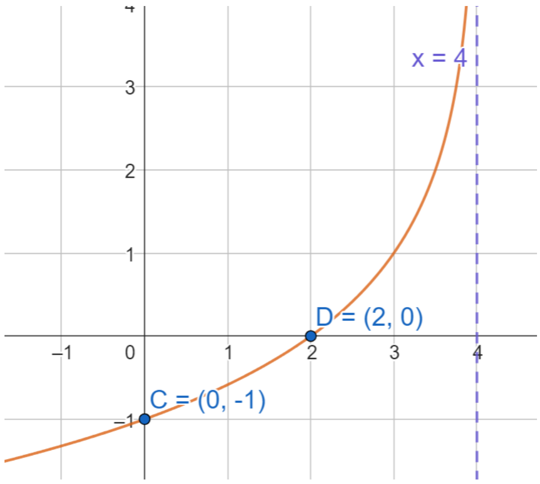
1) (10points) Find out the equations of the logarithmic functions given in the graph below.

The form is either $y = \log_b(x-m)+n$ or $y = \log_b(-x-m)+n$.

[i]



[ii]



2) (25points) Compute the following limits.

[i] $\lim\limits_{x\to+\infty} \dfrac{x^3+2x^2-5x}{100x^2-20x+3}$ [ii] $\lim\limits_{x\to+\infty} \dfrac{x^2-x+3}{3x^2+30}$ [iii] $\lim\limits_{x\to+\infty} \dfrac{x^5+3x^3}{x^{10}-4x^6}$

[iv] $\lim\limits_{x\to+\infty} \dfrac{e^x}{x^{10}}$ [v] $\lim\limits_{x\to+\infty} \dfrac{\sqrt[3]{x}}{\log x}$

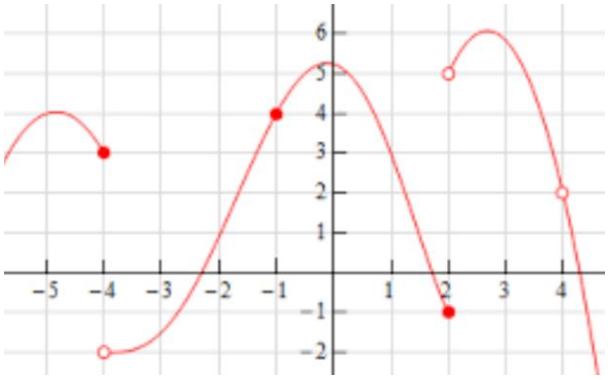
3) (20points) Compute the left and right limits of the given function at the following points and then determine if their limits exist and if the function is continuous at that point.

[i] x=-4

[ii] x=-1

[iii] x=2

[iv] x=4



4) (10points) **Rounded the answers in this problem to 1 decimal places.**

The Richter scale is commonly used to measure the magnitude of earthquakes. It is based on a logarithmic function. The formula to calculate the magnitude M of an earthquake is given by:

$$M = \log_{10}\left(\frac{I}{I_0}\right),$$

where I is the intensity of the earthquake and I_0 is a reference intensity.

A seismograph recorded an earthquake A with an intensity $I_A = 10^7$ units.

The reference intensity I_0 is 10^4 units.

[i] Calculate the magnitude of the earthquake A using the given formula.

[ii] If another earthquake B has an intensity twice that of earthquake A, i.e. $I_B = 2I_A$, what would be earthquake B's magnitude?

5) (15+5points) **Rounded the answers in this problem to 2 decimal places.**

Alice made a cup of hot tea. But the hot tea is too hot to drink. So Alice decides to wait for the tea to cool down. The cooling process follows the formula below:

$$T(t) = (T_0 - T_{env}) \times e^{-\kappa t} + T_{env} ,$$

where T(t) is the temperature at time t (min), T_0 is the initial temperature, T_{env} is the environment temperature, and κ is a constant.

In the beginning, the tea is at $80°C$, the room temperature (T_{env}) is $20°C$. After 10 mins ($t = 10$), the tea is at $60°C$. But it's still too hot for Alice. She wants to wait until the tea is at $40°C$.

[i] Find out the constant κ.

[ii] How long does Alice still need to wait for the tea to cool down to $40°C$?

[iii] Compute the average cooling rate of tea from $80°C$ to $60°C$ and from $60°C$ to $40°C$. Then compare which one is larger.

(This is an additional question, the material in sec 3.4)

[iv] Draw the graph of the temperature function versus time (by a calculator) and find out what the tea's temperature will go if Alice lets the tea cool down forever.

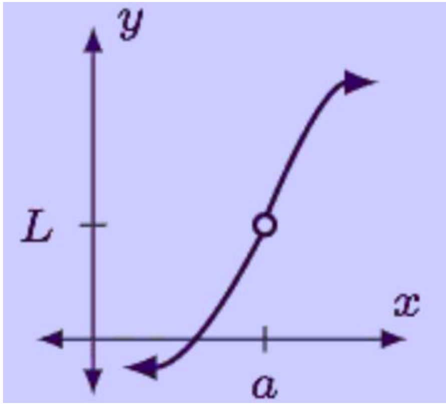
6) (10points)Choose all correct statements in the following:

   (A) The function is continuous on its domain.

   (B) The function is not continuous on its domain.

   (C) The function is continuous at x=a.

   (D) The function is not continuous at x=a.



   Then give a reason to justify your answer: