Tajima HS Solis AP CALC BC

Unit 1: LIMTS AND DERIVATIVES REVIEW - Quiz 1

Name Exemplar **PER** ______ **DATE** ________

1.0	2.0	4.0

Computation

4	3	2	1
Response has no recall errors, *minimal* procedural errors* and no conceptual errors**	**Response has no recall errors, minimal procedural errors and *minimal* conceptual errors**	**Response has no recall errors, but has several procedural errors <u>OR</u> several conceptual errors**	**Recall errors exist <u>OR</u> Steps taken are not related to problem <u>OR</u> Response left blank**

Written Responses

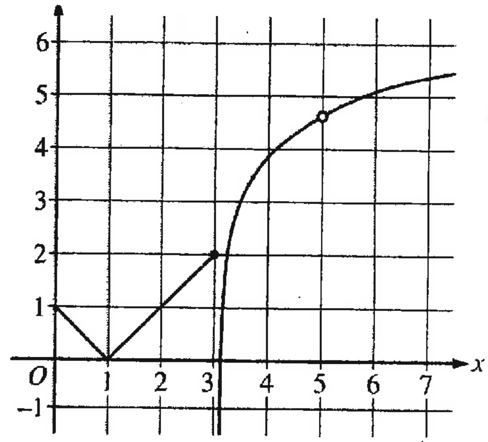
4	3	2	1
Response is written in a complete sentence and uses appropriate academic vocab	**Response is written in a complete sentence, and minimal errors exist in use of academic vocab**	**Response is not written in a complete sentence <u>OR</u> no academic vocab**	**Concept of response is not related to problem <u>OR</u> Response is left blank**

***Procedural errors** are mistakes made in the math
****Conceptual errors** are mistakes made in the steps one take

BOX YOUR ANSWERS!!!

For each problem below, show your work and circle the best possible answer.

1. **(1.0)**



Graph of f

The graph of a function f is shown above. Which of the following limits ~~does not~~ exist?

(A) $\lim_{x \to 1^-} f(x) = 0$ (B) $\lim_{x \to 1} f(x) = 0$ (C) $\lim_{x \to 3^-} f(x) = 2$ (D) $\lim_{x \to 3} f(x)$ (E) $\lim_{x \to 5} f(x) = 4.5$

DNE since the one sided limits are not equal.

Horizontal

2. **(1.0.)**

The continuous function f is positive and has domain $x > 0$. If the asymptotes of the graph of f are $x = 0$ and $y = 2$, which of the following statements must be true?

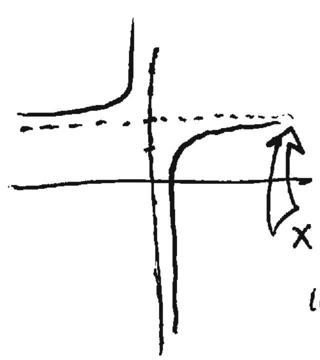
vertical

(A) $\lim_{x \to 0^+} f(x) = \infty$ and $\lim_{x \to 2} f(x) = \infty$ maybe

~~(B)~~ $\lim_{x \to 0^+} f(x) = 2$ and $\lim_{x \to \infty} f(x) = 0$

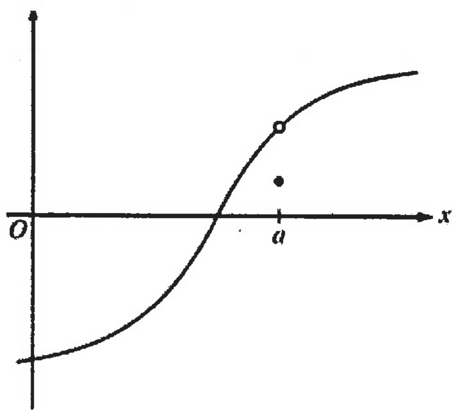
(C) $\lim_{x \to 0^+} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = 2$ maybe

~~(D)~~ $\lim_{x \to 2} f(x) = \infty$ and $\lim_{x \to \infty} f(x) = 2$



X is approaching infinity

3. (2.0) *Explain your answer choice for the question below in the space provided.*



Graph of f

The graph of $y = f(x)$ is shown above. Which of the following is true?

~~(A)~~ $\lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$ exists. Does the derivative exist? No, since not continuous.

~~(B)~~ $\lim_{x \to a^+} f(x) \neq \lim_{x \to a^-} f(x)$ They ~~are~~ equal.

(C) $\lim_{x \to a} f(x) \neq f(a)$

~~(D)~~ $\lim_{x \to a} f(x)$ does not exist. See (B.)↑

Since the graph is approaching the same y-value ~~[illegible]~~ from both the left and right, the limit exists. However, it does not equal the y-value @ $x = a$.

3. (2.0) Circle the best possible answer and show your work.

If f is a continuous function such that $f(2) = 6$, which of the following statements must be true?

~~(A)~~ $\lim_{x \to 1} f(2x) = 3$ → implies $f(2) = 3$ ✗

(B) $\lim_{x \to 2} f(2x) = 12$ → implies $f(4) = 12$ Not enough info!

(C) $\lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} = 6$ → implies $f'(2) = 6$ Not enough info!

(D) $\lim_{x \to 2} f(x^2) = 36$ → implies $f(4) = 36$ Not enough info!

(E) $\lim_{x \to 2} (f(x))^2 = 36$

$$\lim_{x \to 2} (f(x))^2 = \lim_{x \to 2} f(x) f(x)$$
$$= \lim_{x \to 2} f(x) \cdot \lim_{x \to 2} f(x)$$
$$= 6 \cdot 6$$
$$= 36 \checkmark$$

Explain your answer choice for each question below in the space provided.

4. (4.0)

If $f(x) = 3x^2 + 2x$, then $f'(x) =$

(A) $\lim\limits_{h \to 0} \dfrac{\left(3x^2 + 2x + h\right) - \left(3x^2 + 2x\right)}{h}$

(B) $\lim\limits_{x \to 0} \dfrac{\left(3x^2 + 2x + h\right) - \left(3x^2 + 2x\right)}{h}$

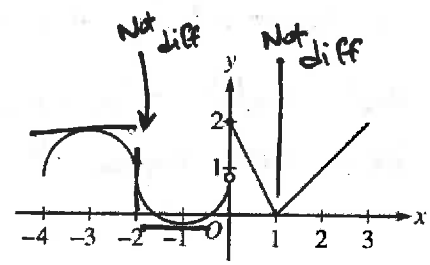
(C) $\lim\limits_{h \to 0} \dfrac{\left(3(x+h)^2 + 2(x+h)\right) - \left(3x^2 + 2x\right)}{h}$

(D) $\lim\limits_{x \to 0} \dfrac{\left(3(x+h)^2 + 2(x+h)\right) - \left(3x^2 + 2x\right)}{h}$

After inputting $(x+h)$ into $3x^2+2x$, the definition of a derivative $\left(\lim\limits_{h \to 0} \dfrac{f(x+h)-f(x)}{h}\right)$ is seen in C.

[Note $h \to 0$, not $x \to 0$]

5. (4.0)



Graph of f

The graph of the piecewise-defined function f is shown in the figure above. The graph has a vertical tangent line at $x = -2$ and horizontal tangent lines at $x = -3$ and $x = -1$. What are all values of x, $-4 < x < 3$, at which f is continuous but not differentiable?

(A) $x = 1$

~~(B)~~ $x = -2$ and $x = 0$ ← not continuous

(C) $x = -2$ and $x = 1$

~~(D)~~ $x = 0$ and $x = 1$

At $x = -2$ and $x = 1$, the function is continuous since their limits exist and they equal their respective y-values. However, they are not differentiable since one has a vertical tangent and another is a sharp corner