AP Calculus Progress Check MCQ Part A

Question 1

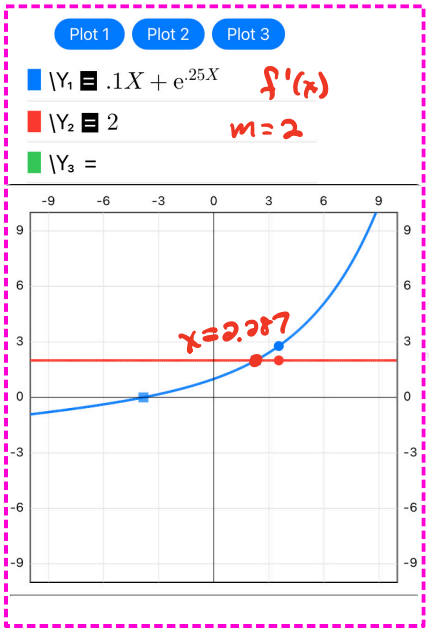
The derivative of a function f is given by $f'(x) = 0.1x + e^{0.25x}$. At what value of x for $x > 0$ does the line tangent to the graph of f at x have slope 2 ?

(A) 0.512

(B) 1.849

(C) 2.287

(D) 8.113



Question 2

x	0	1
$f(x)$	1	2

Let f be the function given by $f(x) = 2^{x^3}$. Selected values of f are given in the table above. If the values in the table are used to approximate $f'(0.5)$, what is the difference between the approximation and the actual value of $f'(0.5)$?

(A) 0

(B) 0.433

(C) 0.567

(D) 1

$$\frac{1-2}{0-1} - \frac{d}{dX}(2^{X^3})_{X=.5}$$

$$0.433086859$$

Question 3

Let f be the function given by $f(x) = \frac{1}{7}x^7 + \frac{1}{2}x^6 - x^5 - \frac{15}{4}x^4 + \frac{4}{3}x^3 + 6x^2$. Which of the following statements is true?

$Y_1 = \frac{d}{dx}\left(\frac{1}{7}x^7 + \frac{1}{2}x^6 - x^5 - \frac{15}{4}x^4 + \frac{4}{3}x^3 + 6x^2\right)\Big|_{x=X}$

(A) $f'(-3.1) < f'(-1.5) < f'(0.4)$

(B) $f'(-3.1) < f'(0.4) < f'(-1.5)$

(C) $f'(-1.5) < f'(0.4) < f'(-3.1)$

(D) $f'(0.4) < f'(-1.5) < f'(-3.1)$

X	Y_1
-3.1	14.9...
-1.5	4.92...
0.4	4.38...

Question 4

x	1	2	3	4	5
$f(x)$	2	3	5	6	14

Selected values of a function f are shown in the table above. What is the average rate of change of f over the interval $[1, 5]$?

$\frac{2-14}{1-5}$ or $\frac{14-2}{5-1}$

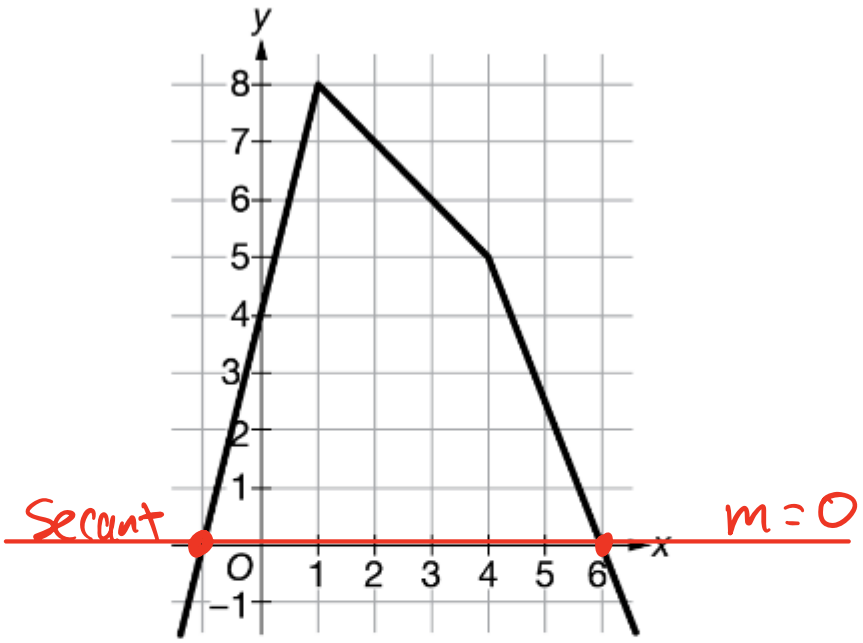
(A) $\frac{5-1}{14-2}$

(B) $\frac{14+2}{5+1}$

(C) $\frac{14-2}{5-1}$

(D) $\frac{2+3+5+6+14}{5}$

Question 5



The graph of the function f, shown above, consists of three line segments. What is the average rate of change of f over the interval $-1 \leq x \leq 6$?

(A) $-\frac{5}{2}$

(B) 0

(C) $\frac{1}{6}$

(D) 4

Question 6

The function f is given by $f(x) = 1 + 3\cos x$. What is the average rate of change of f over the interval $[0, \pi]$?

(A) $-\frac{6}{\pi}$

(B) $-\frac{2}{\pi}$

(C) $\frac{2}{\pi}$

(D) 1

$ARC = \frac{f(0) - f(\pi)}{0 - \pi} = \frac{4 - (-2)}{-\pi} = \frac{6}{-\pi}$

$f(0) = 1 + 3\cos(0) = 1 + 3 \cdot 1 = 4$

$f(\pi) = 1 + 3\cos(\pi) = 1 + 3(-1) = -2$

Question 7

The derivative of the function f is given by $f'(x) = -3x + 4$ for all x, and $f(-1) = 6$. Which of the following is an equation of the line tangent to the graph of f at $x = -1$?

(A) $y = -3x + 3$

(B) $y = -3x + 4$

(C) $y = 7x + 6$

(D) $y = 7x + 13$

POT $(-1, 6)$

SOT $f'(-1) = -3(-1) + 4$

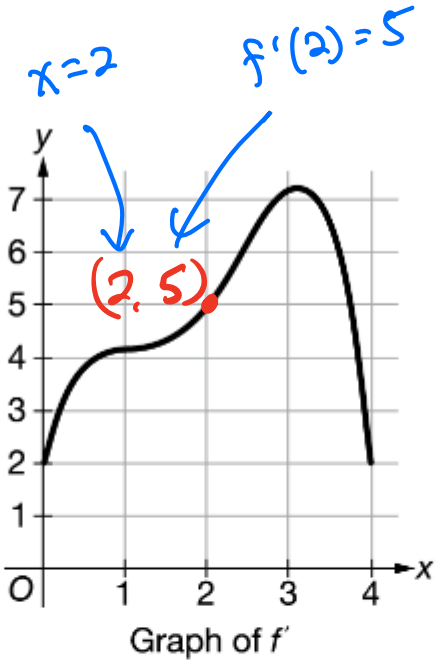
$f'(-1) = 7$

tangent $y - 6 = 7(x - -1)$

$y = 7x + 7 + 6$

$y = 7x + 13$

Question 8



f'

The graph of f', the derivative of a function f, is shown above. The points $(2, 6)$ and $(4, 18)$ are on the graph of f. Which of the following is an equation of the line tangent to the graph of f at $x = 2$?

(A) $y = 2x + 1$

(B) $y = 5x - 4$

(C) $y = 5x - 10$

(D) $y = 6x - 6$

POT (2,6)

SOT f'(2)=5

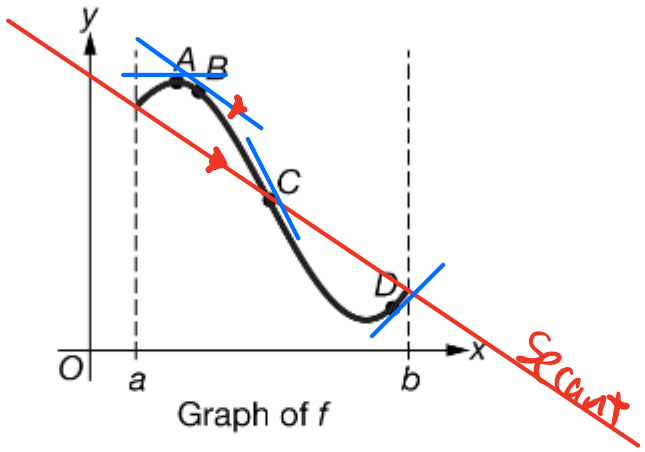
tangent $y - 6 = 5(x - 2)$

$y = 5x - 10 + 6$

$y = 5x - 4$

Question 9

blue lines are tangent.



The graph of the trigonometric function f is shown above for $a \leq x \leq b$. At which of the following points on the graph of f could the instantaneous rate of change of f equal the average rate of change of f on the interval $[a, b]$?

(A) A

(B) B

(C) C

(D) D

Question 10

Which of the following statements, if true, can be used to conclude that $f(2)$ exists?

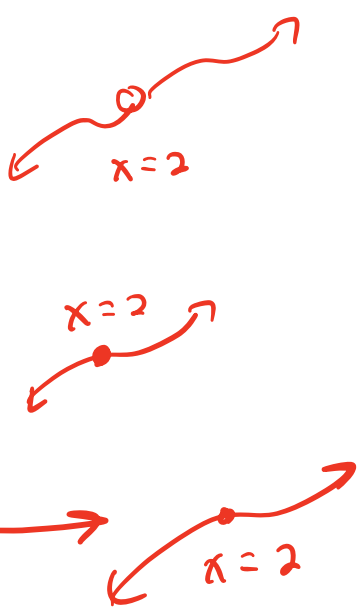
I. $\lim_{x \to 2} f(x)$ exists.
II. f is continuous at $x = 2$.
III. f is differentiable at $x = 2$.

(A) I only

(B) II only

(C) II and III only

(D) I, II, and III



Question 11

$$f(x) = \begin{cases} 3x + 1 & \text{for } x \leq 2 \\ 5x - 3 & \text{for } x > 2 \end{cases}$$

$f(2) = 7$

$\lim_{x \to 2^-} f(x) = 3(2) + 1 = 7$

$\lim_{x \to 2^+} f(x) = 5(2) - 3 = 7$

$\therefore$ continuous

Let f be the function defined above. Which of the following statements is true?

(A) f is neither continuous nor differentiable at $x = 2$.

(B) f is continuous but not differentiable at $x = 2$.

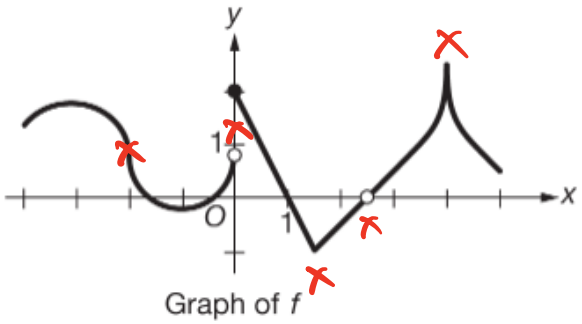
(C) f is differentiable but not continuous at $x = 2$.

(D) f is both continuous and differentiable at $x = 2$.

$$f'(x) = \begin{cases} 3 & \text{for } x \leq 2 \\ 5 & \text{for } x > 2 \end{cases}$$

$\lim_{x \to 2^-} f(x) \neq \lim_{x \to 2^+} f(x)$

Question 12



Graph of f

The graph of the function f, shown above, has a vertical tangent at $x = -2$ and horizontal tangents at $x = -3$ and $x = -1$. Which of the following statements is false?

(A) f is not differentiable at $x = -2$ because the graph of f has a vertical tangent at $x = -2$. True

(B) f is not differentiable at $x = 0$ and $x = 2.5$ because f is not continuous at $x = 0$ and $x = 2.5$. True

(C) f is not differentiable at $x = 1.5$ and $x = 4$ because the graph of f has sharp corners at $x = 1.5$ and $x = 4$. True

(D) f is not differentiable at $x = -3$ and $x = -1$ because the graph of f has horizontal tangents at $x = -3$ and $x = -1$. False

Question 13

If $f(x) = x^5$, then $f'(x) =$ Power Rule

(A) x^4

(B) $4x^4$

(C) $5x^4$

(D) $5x^5$

Question 14

If $f(x) = \frac{1}{x^7}$, then $f'(x) =$

(A) $\frac{1}{7x^6}$

(B) $-\frac{7}{x^6}$

(C) $-\frac{1}{7x^8}$

(D) $-\frac{7}{x^8}$

$f(x) = x^{-7}$

$f'(x) = -7x^{-8} = \frac{-7}{x^8}$

Question 15

If f is the function defined by $f(x) = \sqrt[4]{x}$, what is $f'(x)$?

(A) $\frac{1}{4}x^{\frac{1}{4}}$

(B) $x^{-\frac{3}{4}}$

(C) $\frac{1}{4}x^{-\frac{3}{4}}$

(D) $4 \cdot \sqrt[3]{x}$

$f(x) = x^{\frac{1}{4}}$

$f'(x) = \frac{1}{4}x^{-3/4}$

$= \frac{1}{4\sqrt[4]{x^3}}$