Answer Key

5 for 5 Derivatives

x	0	2	7	9
$g(x)$	-3	-4	-1	-2
$g'(x)$	4	-2	-8	5

1. Selected values of a twice differentiable function, $g(x)$, and its derivative are shown above. Consider the differentiable function h, defined by $h(x) = \sec x\, g(x)$. Find $h'(0)$.

A. 0
B. 1
C. 4
D. undefined

$\sec x \tan x (g(x)) + \sec x (g'(x))$
$\sec(0)\tan(0)(-3) + \sec(0)(4)$
$-3 \cdot \frac{1}{\cos(0)} \cdot \frac{\sin(0)}{\cos(0)} + 4\frac{1}{\cos(0)}$
$-3 \cdot 1 \cdot 0 + 4(1)$
$0 + 4 = 4$

2. What is the slope of the line tangent to $y = 3\ln x - \frac{5}{x}$ at $x = 2$?

A. 11/4
B. 2
C. 1/4
D. $3\ln 2 - 5/4$

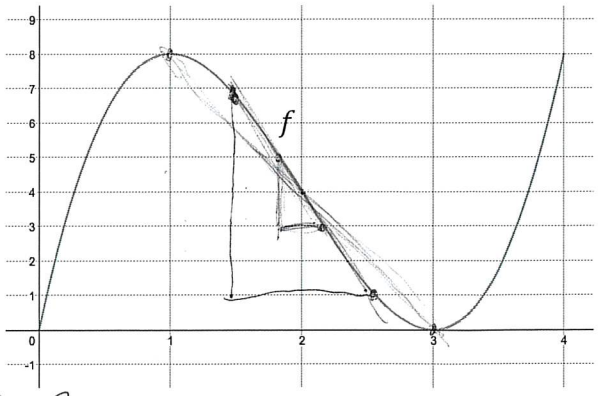
$\frac{dy}{dx} = 3\frac{1}{x} - 5(-1x^{-2})$
$\frac{dy}{dx} = \frac{3}{x} + \frac{5}{x^2}$
$\frac{3}{2} + \frac{5}{4}$
$\frac{6}{4} + \frac{5}{4} = \frac{11}{4}$

3. Which of the following statements is true for the function $f(x)$ defined below?

$$f(x) = \begin{cases} 5x^2 - 8x & for\ x \le 1 \\ \ln x - 3 & for\ x > 1 \end{cases}$$

A. $\lim_{x\to 1^-} f(x) \neq \lim_{x\to 1^+} f(x)$
B. There is a removable discontinuity at $x = 1$.
C. $f(x)$ is continuous and differentiable at $x = 1$.
D. $f(x)$ is continuous but not differentiable at $x = 1$.

4. The graph of $f(x)$ is shown for $0 \le x \le 4$. Put the following in order from least to greatest.



slope ↗

I. $\lim_{h\to 0} \frac{f(2+h)-f(2)}{h}$ m < -4

II. Average rate of change of f on [2,4] $\frac{8-4}{4-2} = \frac{4}{2} = 2$

slope ↗

III. $\lim_{x\to 3} \frac{f(x)-f(3)}{x-3}$ 0

IV. $\frac{f(3)-f(2)}{3-2}$ $\frac{0-4}{3-2} = \frac{-4}{1} = -4$

A. I, II, III, IV

B. I, IV, III, II

C. IV, I, III, II

D. IV, II, I, III

5. Line L is tangent to $y = 5x^2 + 8x$ and parallel to $12x + y = 4$. What is the y-intercept of line L?

$\frac{dy}{dx} = 10x + 8$

$y = -12x + 4$

$m = -12$

~~A. 4~~

B. 8

C. -20

D. 28

$L \rightarrow y = -12x + b$

$10x + 8 = -12$

$x = -2$

$y = 5(-2)^2 + 8(-2)$

$20 - 16$

$y = 4$

$y - 4 = -12(x + 2)$

$y = -12x - 20$