

AOS Math 10, Spring 2024

Derivatives Test (#14)

_____/ 57



ACADEMIES OF LOUDOUN HONOR CODE



Honesty and integrity are the foundations of good academic work. Whether you are working on a problem set, lab report, project, presentation, or paper, do not engage in plagiarism, unauthorized collaboration, cheating, or facilitating academic dishonesty. Our expectation is for our students to be successful while being trustworthy. The honor code is not intended to be punitive, but rather a guide for all students and faculty to follow. For these reasons, the Academies of Loudoun will uphold the following Honor Code:

On my honor, I have not accepted or provided any unauthorized aid on this test, quiz, or assignment.

As an Academies of Loudoun student, you agreed to uphold the Academies Honor Code. Please write the Honor Code Pledge below and sign this document.

May 10, 2024

Student Signature

Class

Date

Print Name:

Instructions: Questions 1-14 are multiple choice. For each problem, circle the letter of the best answer. You **must show all work** for credit. Partial credit may be awarded as appropriate. Each question is valued at 3 points.

1. If $y(x) = \frac{\sin(2x)}{x^2}$ find $y'(x)$

(a) $\frac{x^2 \sin(2x) + 2 \cos(2x)}{x^4}$

(b) $\frac{x^2 \cos(2x) - \sin(2x)}{x^3}$

(c) $\frac{2x \cos(2x) - 2 \sin(2x)}{x^3}$

(d) $\frac{2 \cos(2x)}{x}$

2. Calculate $\frac{d}{dt} (\ln(e^{2t}) - 2t)$

(a) $\frac{2}{e^{2t}} - 2$

(b) $\frac{1}{2t} - 2$

(c) $\frac{1}{2e^{2t}} - 2$

(d) 0

3. If $f(x) = \sin(2x + 1)$ and $g(x) = f'(x)$, find $g'(x)$

(a) $g'(x) = 2 \sin(2x + 1)$

(b) $g'(x) = -4 \sin(2x + 1)$

(c) $g'(x) = -4x \cos(2x + 1)$

(d) $g'(x) = 4 \sin(2x + 1) \cos(2x + 1)$

4. If f and h are nonzero differentiable functions, then the derivative of $\frac{f}{h}$ is

(a) $\frac{f'h - fh'}{h^2}$

(b) $\frac{f'h + fh'}{h^2}$

(c) $\frac{fh' - f'h}{h^2}$

(d) $\frac{f'}{h'}$

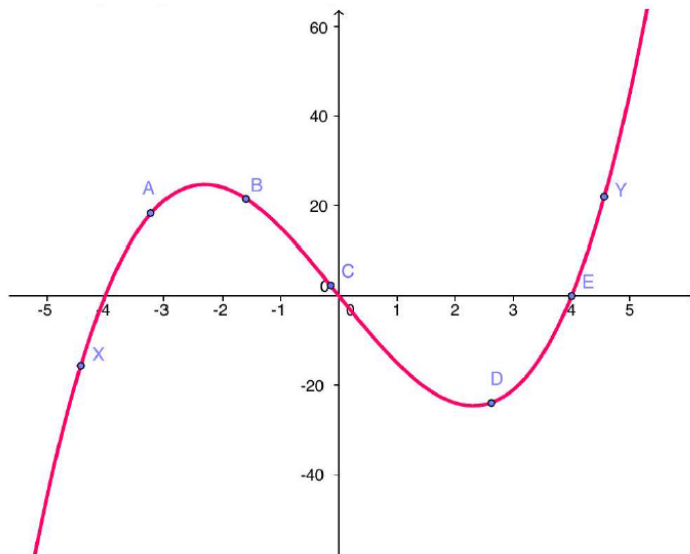
5. If $y = 6 \ln(3x)$ then what is y' ?

- (a) $\frac{1}{3x}$
- (b) $\frac{6}{x}$
- (c) $\frac{18}{x}$
- (d) $\frac{2}{x}$

6. Let $f(x) = \sqrt{x}$. What is the equation of the tangent line to f at the point $(4, 2)$?

- (a) $y = 2x - 6$
- (b) $y = -\frac{1}{2}x + 3$
- (c) $y = \frac{1}{4}x + 1$
- (d) $y = \frac{1}{2}x$

7. The graph of a continuous differentiable function f is shown below.



Using the above graph, select the one true statement below.

- (a) $f'(C) < f'(D) < f'(Y)$
- (b) $f'(X) < f'(B) < f'(E)$
- (c) $f'(A) < f'(B) < f'(C)$
- (d) $f'(X) < f'(Y) < f'(C)$

-
8. Let $f(x) = x^3 - 6x^2 + 10$. At which point(s) on the graph of f is the tangent line parallel to the line $15x - y = 11$?
- (a) $(2, -6)$ and $(-2, -22)$
 - (b) $(5, -15)$ and $(2, -6)$
 - (c) $(2, -6)$ and $(-2, 22)$
 - (d) $(5, -15)$ and $(-1, 3)$
9. If $h(x) = f(x^2 + 1)$ then which of the following is true?
- (a) $h'(x) = 2xf'(2x)$
 - (b) $h'(x) = f'(2x)$
 - (c) $h'(x) = 2xf'(x^2 + 1)$
 - (d) $h'(x) = f'(x^2 + 1)$
10. What is the derivative of $s(t) = \cos(t^2 + 1)$?
- (a) $-(t^2 + 1) \sin(t^2 + 1)$
 - (b) $\cos(2t)$
 - (c) $-2t \sin(t^2 + 1)$
 - (d) $-\sin(2t)$
11. At which x value does the graph of $y = 3x^2 - 10x + 15$ have a horizontal tangent line?
- (a) $\frac{-5}{3}$
 - (b) $\frac{-3}{5}$
 - (c) $\frac{3}{5}$
 - (d) $\frac{5}{3}$

12. If $w(t) = \sqrt{t^2 - 1}$ what is the value of $w'(4)$?

- (a) $\frac{4}{\sqrt{15}}$
- (b) $\frac{1}{\sqrt{15}}$
- (c) $\frac{2}{\sqrt{15}}$
- (d) $\frac{1}{2\sqrt{15}}$

13. What is the value of

$$\lim_{\Delta x \rightarrow 0} \frac{2(x + \Delta x)^2 - 2x^2}{\Delta x}$$

- (a) 2
- (b) $2x$
- (c) $4x$
- (d) 4

14. The line tangent to the curve $y = \sqrt{16 - x}$ at the point $(0, 4)$ has slope

- (a) $-\frac{1}{8}$
- (b) $\frac{1}{8}$
- (c) 4
- (d) -4

Free Response Section: Selected values of f, g, f', g' are given in the table below.

x	0	1	2	3	4
$f(x)$	$\frac{1}{2}$	$\frac{1}{3}$	1	-1	3
$g(x)$	-2	1	$-\frac{1}{2}$	2	$-\frac{1}{3}$
$f'(x)$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{1}{4}$	0	$-\frac{4}{5}$
$g'(x)$	-1	$\frac{2}{3}$	-4	-3	$-\frac{1}{3}$

Using the values in the table, evaluate the following derivatives. **You must show the symbolic derivative as the first part of your answer for credit!**

15. $\frac{d}{dx} (f(x) + g(x))$ at $x = 4$

16. $\frac{d}{dx} (f(x)g(x))$ at $x = 1$

17. $\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right)$ at $x = 0$

18. $\frac{d}{dx} (f(g(x)))$ at $x = 3$

19. $\frac{d}{dx} (g(x + f(x)))$ at $x = 3$

KEY

1. C
2. D
3. B
4. A
5. B
6. C
7. A
8. D
9. C
10. C
11. D
12. A
13. C
14. A