

Unit 3 Exam

Recommended amount of time: 1 hour 30 mins

- Topics covered on this exam:
 - Implicit differentiation
 - Inverse functions
 - Inverse trig derivatives
 - Exponential and logarithmic derivatives
 - Graph of a derivative
- This exam is composed of 14 multiple choice questions and 2 free response questions
- Calculators are allowed for computation use only (addition, division, square root, exponents, etc.)
- For the free response section, show all of your work (think about partial credit on an actual test)
- When you are finished with the test, see which questions you got wrong and review those questions





1. What is the derivative of the function $f(x) = e^{2x-1}$?

- (A) $2e^{2x-1}$ (B) $\frac{2}{e^{2x-1}}$ (C) e^{2x-1} (D) $(2x - 1)e^{2x-1}$ (E) $\frac{e^{2x-1}}{2x-1}$

2. $\frac{d}{dx}(4^x) =$

- (A) 4^{x-1} (B) $(4^{x-1})x$ (C) $(4^x)\ln(4)$ (D) $(4^{x-1})\ln(4)$ (E) $\frac{4x}{\ln(4)}$

3. If $2x^2 + 2y^2 = 1$, then the value of $\frac{dy}{dx}$ at $\left(\frac{1}{2}, \frac{-1}{2}\right)$ is

- (A) $-\frac{1}{3}$ (B) 1 (C) $\frac{1}{3}$ (D) $-\frac{1}{6}$ (E) $\frac{1}{6}$



4. Let f be a differentiable function such that $f(2) = 11$, $f(7) = 2$, $f'(2) = -1$, and $f'(7) = \frac{1}{2}$. The function g is differentiable and $g(x) = f^{-1}(x)$ for all x . What is the value of $g'(2)$?

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

(B) $\frac{1}{2}$

(C) 2

(D) -2

(E) The value of $g'(2)$ cannot be determined from the information given

5. Let f be the function defined by $f(x) = x^2 - 8$. If $g(x) = f^{-1}(x)$ and $g(1) = 3$, what is the value of $g'(1)$?

(A) $-\frac{1}{6}$

(B) $-\frac{1}{2}$

(C) -6

(D) -2

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

6. What is $\frac{d}{dx}(e^{\ln(x)})$?

(A) $\frac{-e^{\ln(x)}}{x}$

(B) $\ln(x) e^{\ln(x)}$

(C) $e^{\ln(x)}$

(D) $\frac{1}{e^{\ln(x)}}$

(E) 1

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7. If $3x + x^2y - y^2 = 11$, then $\frac{dy}{dx}$ is

(A) 3

(B) 0

(C) $\frac{3x}{2y-x^2}$

(D) $\frac{3}{2y-2x}$

(E) $\frac{3+2xy}{2y-x^2}$

8. What is $\frac{d}{dx}(\tan^{-1}(x^2 + 1))$?

(A) $\frac{1}{\sqrt{1-x^2}}$

(B) $\frac{2x}{1+x^2}$

(C) $\frac{-2x}{\sqrt{1-(x^2+1)^2}}$

(D) $\frac{2x}{1+(x^2+1)^2}$

(E) $\frac{-2x}{1+x^2}$

9. Find $\frac{d^2y}{dx^2}$ for the equation $2x^3 - y^2 = -2$

(A) $\frac{6xy - 9x^4}{y^2}$

(B) $\frac{6x - 9x^4}{y}$

(C) $\frac{6x - 9x^4}{y}$

(D) $\frac{6xy - 9x^2}{y}$

(E) $\frac{6xy - 9x^4}{y^2}$

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10. If $f(x) = \ln \frac{4x+1}{(3x-2)^2}$, then $f'(x) =$

- (A) $\frac{(3x-2)^2}{4x+1}$ (B) $-\frac{12x+14}{12x^2-5x-2}$ (C) $\frac{5x+4}{12x^2-5x-2}$ (D) $\frac{2(3x-2)^2}{3(4x+1)}$ (E) $\frac{4(3x-2)^2}{3(4x+1)}$

11. If $3r = t + 7$, then at the point $(3,2)$, $\frac{dr}{dt}$ is

- (A) $\frac{22}{3}$ (B) 3 (C) 2 (D) $\frac{1}{3}$ (E) $-\frac{22}{3}$

12. What is the slope of the function $f(x) = \csc^{-1}(3x)$?

- (A) $\frac{-3}{1+x^2}$ (B) $\frac{3}{|3x|\sqrt{9x^2-1}}$ (C) $\frac{-3}{|3x|\sqrt{3x^2-1}}$ (D) $\frac{3}{|x|\sqrt{x^2-1}}$ (E) $\frac{-3}{|3x|\sqrt{9x^2-1}}$

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13. What is the slope of the tangent line to the function $f(x) = \ln(x^2)$ at the point $(1,0)$?

(A) 0

(B) -1

(C) 2

(D) 1

(E) $\frac{1}{2}$

14. What is $\frac{d}{dx}(\log_4(x^2 - x))$?

(A) $\frac{2x-1}{(x^2-x)\ln 4}$

(B) $\frac{2x-1}{\log_4(x^2-x)}$

(C) $\frac{2x-1}{(x^2-x)}$

(D) $\frac{1}{(x^2-x)}$

(E) $\frac{1}{\log_4(x^2-x)}$



Free Response

1. The function f is differentiable for all real numbers. The graph of $y = f(x)$ is given by the equation $\ln y = 3x - x^2$.

A) Show that $\frac{dy}{dx} = y(3 - 2x)$ using implicit differentiation

B) Find $\frac{d^2y}{dx^2}$ (use $\frac{dy}{dx}$ to solve this part and do not leave $\frac{dy}{dx}$ in the answer)

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Dan the Tutor



Learn by Doing

C) Finds the coordinates for each point where the tangent line is horizontal.

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2. Using the table below, determine if there is enough information to find the quantities. If there is enough information, find the values:

A) $f^{-1}(0)$

B) $f^{-1}(2)$

C) $(f^{-1})'(-2)$

D) $(f^{-1})'(4)$

x	$f(x)$	$f'(x)$
-2	-3	$1/2$
0	-2	1
1	0	3
2	4	2