

AP CALCULUS AB
Unit 2
Exam – Sample

Name _____
Date _____
Period _____

No calculators may be used on this portion of the test.

1. Consider the curve C defined by $x^2 + xy - y^2 = 5$.

a. Calculate $\frac{dy}{dx}$.

b. Find an equation for the line tangent to C at the point $(3, -1)$.

2. Calculate $\left. \frac{d^3y}{dx^3} \right|_{x=4}$ given $y = \frac{2}{\sqrt{x}}$.

3. A normal line is the line perpendicular to a given tangent line that passes through the point of tangency. Given $f(4) = 3$ and $f'(4) = 2$, find the equations for both the tangent and normal lines to $f(x)$ at $x = 4$.

4. At what point(s) on the curve $y = (\ln(x + 4))^2$ is the tangent horizontal?

5. Find the derivative for each of the following functions. (Don't panic!! There will not be this many derivative problems on the exam. We just want you to practice a lot!!)

a. $z = \frac{e^y}{y^2}$

b. $y = \frac{x^2 - 2\sqrt{x}}{x}$

c. $R(t) = \frac{5}{t^{3/5}}$

d. $h(r) = (r^2 - 2r)e^r$

e. $r = \frac{e^u}{\cos u}$

f. $f(\theta) = \frac{1}{\tan^2 \theta}$

g. $y = \log 5x - 5^x$

h. $r(x) = \tan^{-1}(1-x)$

i. $h(t) = \sqrt{2t} - \arcsin t$

j. $y = \frac{1}{\sqrt{e^x - x^2}}$

k. $y = x^{\ln x}$

l. $f(x) = (x-1)^4 (2x+5)^5$

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6. Use the table below to answer the following. Show all work that leads to your answers.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	-2	3	5	-8
4	3	-4	-1	3
6	-5	3	2	0
8	2	-3	-4	-8
10	2	-5	2	1

a. Find $y'(4)$ given $y = x + g(\sqrt{x})$.

b. Find $y'(8)$ given $y = f(x)(g(x))^2$.

c. Find $y'(-5)$ given $y = f^{-1}(x)$.

7. Suppose $g(x) = f^{-1}(x)$ and $f(x) = e^{-3x} - x$. Evaluate $g'(3)$.

8. Find the points for any horizontal and vertical tangent lines to the curve defined by

$$y^3 - x^3 = 8y + 9x - 1 \text{ given } \frac{dy}{dx} = \frac{3x^2 + 9}{3y^2 - 8}.$$