

Math 180 Written Homework

Assignment #6

Due **Tuesday, October 14th** at the beginning of your discussion class.

Directions. You are welcome to work on the following problems with other MATH 180 students, but your solutions must be hand-written, by your own hand, representing your understanding of the material. Word-by-word copying from another student or any other source is unacceptable. Any work without the proper justification will receive no credit. The list of problem solutions is to be submitted to your TA at the beginning of the discussion class listed above. No late homework will be accepted.

- Let $y = \cos^{-1} x$.
 - Using the fact that $\cos y = x$, find $\frac{dy}{dx}$ by implicit differentiation.
 - Using the identity $\cos^2 y + \sin^2 y = 1$, write $\sin y$ as a function of x . In other words, solve the equation for $\sin y$.
(Hint: The range of the function $y = \cos^{-1} x$ is $[0, \pi]$. Therefore $\sin y \geq 0$.)
 - Using the previous two steps, find $\frac{d}{dx}(\cos^{-1} x)$.
- Let f be a function differentiable on $(-\infty, +\infty)$. Find the slope of the curve $y = f^{-1}(x)$ at $(4, 7)$ if the following table of values of f and f' is given

x	0	4	7
$f(x)$	7	2	4
$f'(x)$	5	7	9

- Compute the derivative of each function.
 - $\ln(2x + 1)^3$
 - $\log_{10} \left(\frac{7}{\sqrt{x+3}} \right)$
 - $2^{\ln(x)}$
- Consider the function $f(x) = \cos(3 \cos^{-1} x)$.
 - What is the domain of the function f ?
 - Calculate the derivative $f'(x)$.

- (c) Find the equation of the tangent line to the graph of f at $x = \frac{1}{2}$.
- (d) Use the angle addition rules for $\sin(x)$ and $\cos(x)$ to show that $f(x) = 4x^3 - 3x$ on its domain.
5. Let $f(x) = 2x^3 - x + 5$. Find $(f^{-1})'(6)$.
6. Use logarithmic differentiation to find $\frac{dy}{dx}$ for each of the following functions
- (a) $y = (\ln x)^{\ln x}$
- (b) $y = \frac{(5x^2 + 2)^6}{(1 - 4x)^{10}}$
- (c) $y = x^{\sin x}$
7. Let $f(x) = \frac{1}{4} \cdot 2^x$.
- (a) Find $f'(x)$.
- (b) Find $f''(x)$.
- (c) Find a formula for $f^{(n)}(x)$.
- (d) Find a function $g(x)$ such that $g'(x) = f(x)$.