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MATH 1432 - QUIZ 1

Show your work to get proper credit.

(1)[3 Pts] Is the function $f(x) = 8 + 3x^3$ a one-to-one function? If so, find its inverse.

① Check ONE-TO-ONE.

$f'(x) = 9x^2 > 0 \quad \forall x \ (x \in (-\infty, \infty))$

$\Leftrightarrow$ f is increasing

$\Leftrightarrow$ f is ONE-TO-ONE.

② Using Three Steps to find inverse:

I. $y = f(x) \Rightarrow y = 8 + 3x^3$

II. Switch x and y $\Rightarrow x = 8 + 3y^3$

III. Find "y" $\Rightarrow x - 8 = 3y^3$

$\Rightarrow \left(\frac{x-8}{3}\right)^{\frac{1}{3}} = \left(y^3\right)^{\frac{1}{3}}$

$\Rightarrow y = \left(\frac{x-8}{3}\right)^{\frac{1}{3}}$

$f^{-1}(x) = \left(\frac{x-8}{3}\right)^{\frac{1}{3}}$

(2)[3 Pts] Find the derivate of $f(x) = \cos(\ln(x+4))$.

By Chain Rule.

$(f(x) = g(h(x)), \ g(y) = \cos y, \text{ and } h(x) = \ln(x+4))$

$f'(x) = [g(h(x))]' = g'(h(x)) \cdot h'(x) = -\sin(\ln(x+4)) \cdot \frac{1}{x+4} \cdot 1$

$= -\frac{\sin(\ln(x+4))}{x+4}$

(3)[4 Pts] Evaluate the following integral: $\int \frac{\tan(\ln(x))}{x} dx$

(Key: $\int \tan x \, dx = \ln|\sec(x)| + C$ or $-\ln|\cos(x)| + C$)

(Using u-substitution)

let $u = \ln(x)$. $du = \frac{dx}{x}$.

Then $\int \frac{\tan(\ln(x))}{x} dx = \int \tan u \, du = \ln|\sec(u)| + C$

$= \ln|\sec(\ln(x))| + C$

or $-\ln|\cos(\ln(x))| + C$