Quiz 6
Name:
Perm:
Section Day and Time:

1. Find f'(x) if

$$f(x) = sin(x)sec(x)cot(x) + cos(x)csc(x)tan(x).$$

(Hint:Think before you differentiate)

$$f(x) = (\cancel{\sin x})\left(\frac{1}{\cancel{\cos x}}\right)\left(\frac{\cancel{\cos x}}{\cancel{\sin x}}\right) + (\cancel{\cos x})\left(\frac{1}{\cancel{\sin x}}\right)\left(\frac{\cancel{\sin x}}{\cancel{\cos x}}\right)$$

$$= 1 + 1 = 2$$

Then $f(x) = 2$ so $f'(x) = 0$

If you don't know your trig functions you need to use the product rule on both terms of f(x), which will in turn require two more product rule applications each.

2. Find f''(x) if

$$f(x) = \frac{x}{x^2 - 1}.$$

There are many ways to do this. (1) Writing $x^2-1 = (x+1)(x-1)$ avoids the chain rule.
(2) Write $f(x) = x(x^2-1)^{-1} \longrightarrow$ product (+ chain) rule

(3) Quotient rule: $f'(x) = \dfrac{(x^2-1)(1) - (x)(2x)}{(x^2-1)^2} = \dfrac{-x^2-1}{(x^2-1)^2}$

so $f''(x) = \dfrac{(x^2-1)^2(-2x) - (-x^2-1)(2(x^2-1)(2x))}{(x^2-1)^4} = \dfrac{2x(x^2+3)}{(x^2-1)^3}$

$=$ (after simplifying)

(4) Logarithmic differentiation:
From $f'(x) = \dfrac{-x^2-1}{(x^2-1)^2}$ we have $\ln(f'(x)) = \ln\left(\dfrac{-x^2-1}{(x^2-1)^2}\right) = \ln(-x^2-1) - 2\ln(x^2-1)$

so $\dfrac{1}{f'(x)} \cdot f''(x) = \dfrac{-2x}{-x^2-1} - \dfrac{4x}{x^2-1}$

$\longrightarrow f''(x) = \left(\dfrac{-x^2-1}{(x^2-1)^2}\right)\left(\dfrac{-2x}{(-x^2-1)} - \dfrac{4x}{x^2-1}\right) =$ simplify....