

Math 220 AD9, Spring 2009, Quiz 4

Name: Answer Key

1. (Q. 17, p. 194) Find the derivative of the function

$$f(x) = \frac{x}{\sqrt{x^2+1}}$$

One function divided by another $\frac{f(x)}{g(x)} \rightarrow$ Quotient Rule.
 When finding $g'(x)$, need to use chain rule.

$$f'(x) = \frac{\sqrt{x^2+1} \cdot 1 - x \left(\frac{1}{2} (x^2+1)^{-\frac{1}{2}} \right) (2x)}{x^2+1} = \frac{(x^2+1)^{\frac{1}{2}} - x^2 (x^2+1)^{-\frac{1}{2}}}{x^2+1}$$

$$\left(= \frac{x^2+1 - x^2}{(x^2+1)^{\frac{3}{2}}} = \frac{1}{(x^2+1)^{\frac{3}{2}}} \right)$$

2. (Q. 9, p. 203) Find the derivative of the function

$$f(x) = \sin(\tan(x^2))$$

Differentiate the "outside" function first.

$$\frac{d}{dx} (\sin u) = (\cos u) u'(x) \quad \text{Chain Rule}$$

\uparrow
 undifferentiated

When calculating derivative of "inside" function $\tan(x^2)$, need to use chain rule again.

$$F'(x) = \cos(\tan(x^2)) \cdot \sec^2(x^2) \cdot (2x)$$

derivative of $\tan t$ is $\sec^2 t$ \leftarrow derivative of x^2