Common Calculus Mistakes

Chain Rule: Power Rule

The Goal

Find

$$\frac{d}{dx}(1-x^2)^{-\frac{1}{2}}$$

The Mistake

Find the mistake:

$$\frac{d}{dx}(1-x^2)^{-\frac{1}{2}} = -\frac{1}{2}(1-x^2)^{-\frac{3}{2}}$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dx}(1-x^2)^{-\frac{1}{2}} = -\frac{1}{2}(1-x^2)^{-\frac{3}{2}}\cdot ?$$

The Correction

$$\frac{d}{dx}(1-x^2)^{-\frac{1}{2}} = -\frac{1}{2}(1-x^2)^{-\frac{3}{2}}(-2x) = x(1-x^2)^{-\frac{3}{2}}$$

An Explanation

The first part of using the chain rule is correct. But the second part, that of *multiplying by the derivative of the inside expression*, in this case $1\text{-}x^2$, is completely missing. Remember, the chain rule says:

$$\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$$

In this example

$$f(x) = x^{-\frac{1}{2}} \text{ and } g(x) = 1-x^2, \text{ so } f'(g(x)) = -\frac{1}{2}(1-x^2)^{-\frac{3}{2}} \text{ and } g'(x) = -2x.$$