Common Calculus Mistakes
Chain Rule: Inverse Sine

Some problems provide the opportunity for more than one mistake.

The Goal

Find

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

Mistake 1

Find the mistake:

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1-x^4}}$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1-x^4}}\cdot?$$

Correction 1

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1-x^4}}(2x)$$

Mistake 2

Find the mistake:

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

Need a hint? Look carefully at the red part:

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

Correction 2

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1-x^4}}2x$$

Mistake 3

Find the mistake:

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1+x^4}}2x$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1+x^4}}2x$$

Correction 3

$$\frac{d}{dx}\sin^{-1}(x^2) = \frac{1}{\sqrt{1-x^4}}2x$$

Explanations

In the first mistake the chain rule is not used correctly. The chain rule says:

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

In this example $f(x) = \sin^{-1}(x)$ and $g(x)=x^2$. The $g'(x) = 2x$ part is missing from the mistake.

In the second mistake the derivative was computed as $f'(x)g'(x)$.

In the third mistake the derivative of inverse sine is incorrect.