# Derivatives of inverse trig functions



## Practice problems

1. Find the derivative of $f(x) = \arcsin(\sqrt{x})$.
2. Find the derivative of $g(x) = \arctan(e^{2x})$.
3. Find the derivative of $h(x) = \ln(\arctan(x))$.

## Solutions

1. Find the derivative of $f(x) = \arcsin(\sqrt{x})$.

   - Identify the outer function as $\arcsin(u)$ and the inner function as $u = \sqrt{x}$.
   - The derivative of $\arcsin(u)$ is $\frac{1}{\sqrt{1-u^2}}$.
   - The derivative of $\sqrt{x}$ is $\frac{1}{2\sqrt{x}}$.
   - Apply the chain rule: $f'(x) = \frac{1}{\sqrt{1-(\sqrt{x})^2}} \cdot \frac{1}{2\sqrt{x}}$.
   - Simplify the expression: $f'(x) = \frac{1}{2\sqrt{x}\sqrt{1-x}}$.

   **Answer:** f'(x) = \frac12\sqrtx-xˆ2

2. Find the derivative of $g(x) = \arctan(e^{2x})$.

   - Identify the outer function as $\arctan(u)$ and the inner function as $u = e^{2x}$.
   - The derivative of $\arctan(u)$ is $\frac{1}{1+u^2}$.
   - The derivative of $e^{2x}$ is $2e^{2x}$ using the chain rule.
   - Apply the chain rule: $g'(x) = \frac{1}{1+(e^{2x})^2} \cdot 2e^{2x}$.
   - Simplify the exponent: $(e^{2x})^2 = e^{4x}$.

   **Answer:** g'(x) = \frac2eˆ2x1+eˆ4x

3. Find the derivative of $h(x) = \ln(\arctan(x))$.

   - Identify the outer function as $\ln(u)$ and the inner function as $u = \arctan(x)$.
   - The derivative of $\ln(u)$ is $\frac{1}{u}$.
   - The derivative of $\arctan(x)$ is $\frac{1}{1+x^2}$.
   - Apply the chain rule: $h'(x) = \frac{1}{\arctan(x)} \cdot \frac{1}{1+x^2}$.

   **Answer:** h'(x) = \frac1(1+xˆ2)\arctan(x)

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