

Due date: _____

Name: _____

1. Prove that the derivative of $y = \cot x$ is $\frac{dy}{dx} = -\csc^2 x$ by using the derivatives of $\sin x$ and $\cos x$.

2. Prove that the derivative of $y = \sec x$ is $\frac{dy}{dx} = \sec x \tan x$ by using the derivative of $\cos x$.

3. Prove that the derivative of $y = \csc x$ is $\frac{dy}{dx} = -\csc x \cot x$ by using the derivative of $\sin x$.

4. Prove that the derivative of $y = \ln x$ is $\frac{dy}{dx} = \frac{1}{x}$.

5. Prove that the derivative of $y = \sin^{-1} x$ is $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$.

6. Prove that the derivative of $y = \cos^{-1} x$ is $\frac{dy}{dx} = \frac{-1}{\sqrt{1-x^2}}$.

7. Prove that the derivative of $y = \tan^{-1} x$ is $\frac{dy}{dx} = \frac{1}{1+x^2}$.

8. Prove that the derivative of $y = \cosh x$ is $\frac{dy}{dx} = \sinh x$.

9. Prove that the derivative of $y = \tanh x$ is $\frac{dy}{dx} = \operatorname{sech}^2 x$ by using the derivatives of $\sinh x$ and $\cosh x$. Recall that $\cosh^2 x - \sinh^2 x = 1$.

Review

10. Differentiate the following functions.

a) $y = x^2 \sin \sqrt{x}$

b) $f(x) = 2^{(\sin^{-1} x)^2}$

c) $f(x) = 2 \tan^{-1}(\ln x)$

d) $y = x^{\cos x}$

Q: A murderer is condemned to death. He has to choose between three rooms. The first is full of raging fires, the second is full of assassins with loaded guns, and the third is full of lions that haven't eaten in 3 years. Which room is safest for him?

Optional exercises from the Stewart textbook if you'd like more practice:

None! Just practice the proofs. 😊