Welcome to our

CALCULUS CLASS

with first group

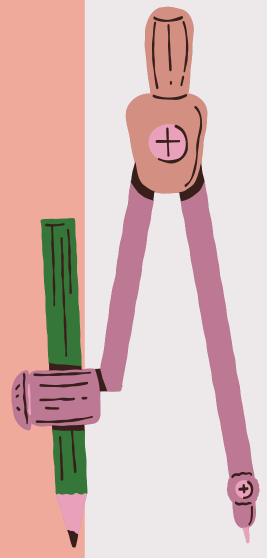
TODAY WE'LL DISCUSS

1. inverse function
2. derivative of inverse function
3. inverse trigonometric functions

INVERSE FUNCTION

An inverse function is a mathematical operation that "undoes" the effect of another function. If y=f(x), then the inverse function is denoted as f−1(y) or y=f−1(x), and it essentially swaps the roles of x and y. In simpler terms, if f(a)=b, then f−1(b)=a, providing a way to retrieve the original input from the output of the original function. For an inverse function to exist, the original function must be one-to-one, meaning that each distinct input corresponds to a unique output.

DERIVETIVE OF INVERSE FUNCTION



The derivative of an inverse function is related to the derivative of the original function. If y=f(x) and f−1(x) is the inverse function, then the derivative of the inverse function, denoted as dx/d[f−1(x)], is given by:.

$$\left[f^{-1}(x)\right]' = \frac{1}{f'\left(f^{-1}(x)\right)}$$

Here, f′(f−1(x)) represents the derivative of the original function evaluated at f−1(x). In simpler terms, the derivative of an inverse function is the reciprocal of the derivative of the original function at the corresponding point. This relationship is crucial for understanding the rate of change of inverse functions in calculus.

Inverse Trigonometric Derivatives

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

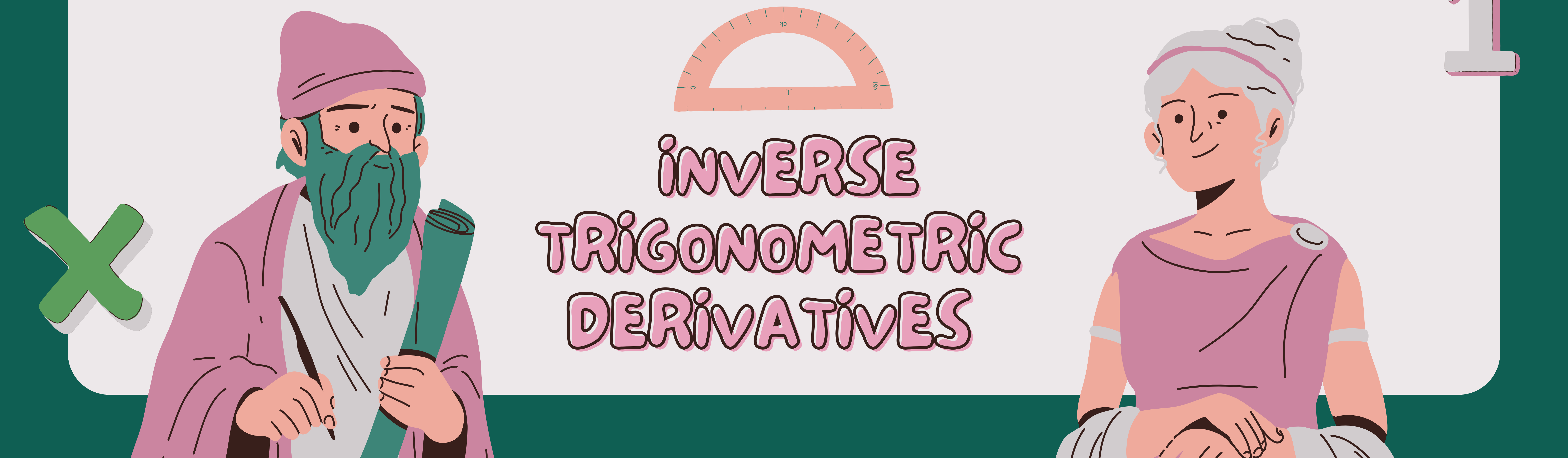
$$\frac{d}{dx}(\tan^{-1}x) = \frac{1}{1+x^2}$$

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

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

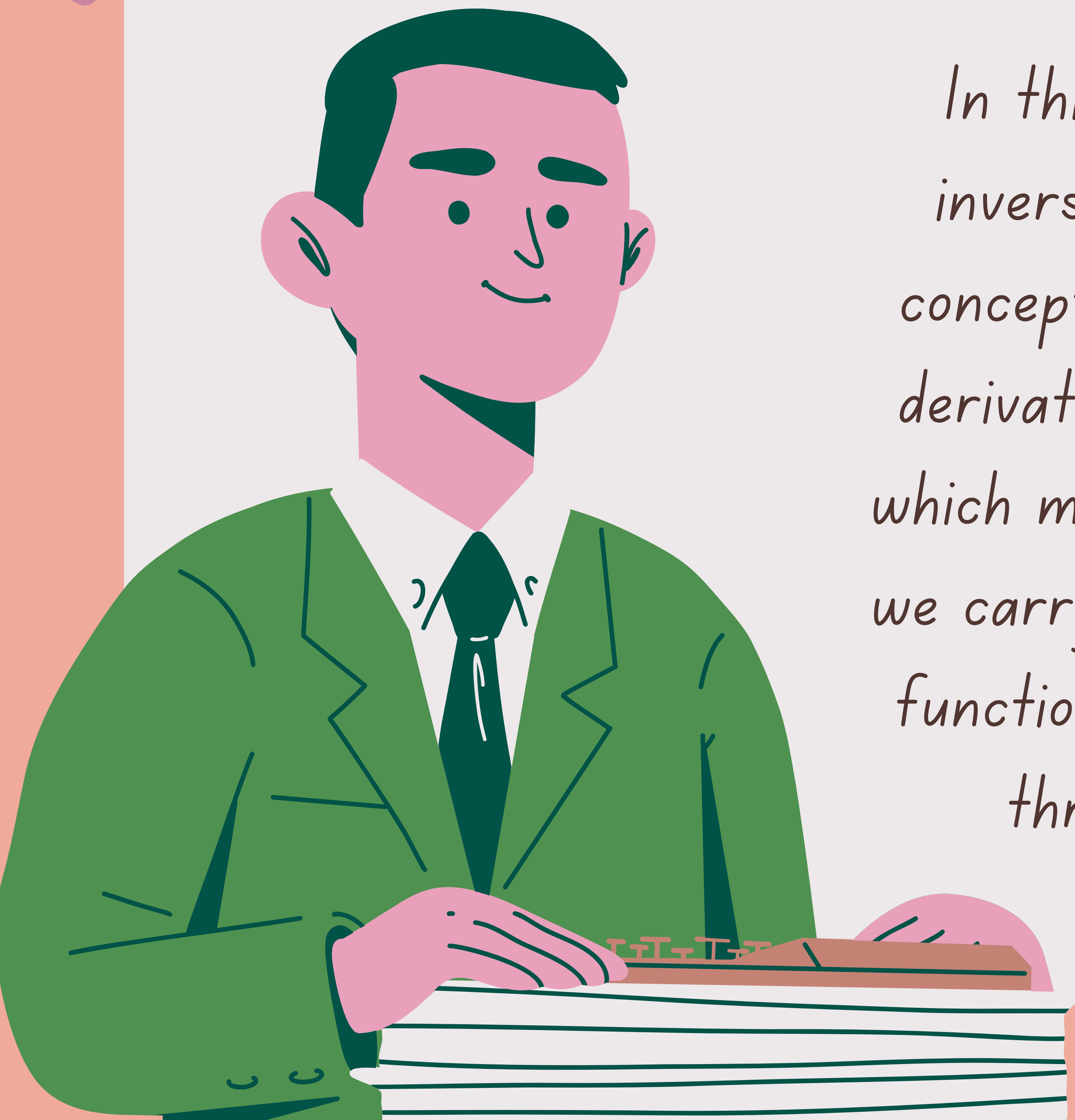
$$\frac{d}{dx}(\cot^{-1}x) = -\frac{1}{1+x^2}$$

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



CONCLUSION

In this mathematical sojourn, we've unraveled the elegance of inverse functions and their derivatives. From the fundamental concept of undoing operations to the intricacies of trigonometric derivatives, our exploration has illuminated the pathways through which mathematics unveils its secrets. As we conclude this journey, we carry with us a deeper understanding of the interplay between functions and their inverses, a knowledge compass that guides us through the mathematical landscapes yet to be explored.



THANK YOU!