

Learning outcomes

After completing this section, you will inshaAllah be able to

1. find derivatives of functions defined implicitly
2. find derivatives of expressions involving inverse trigonometric functions
3. find higher order derivatives of implicitly defined functions

How to perform implicit differentiation?

Recall:

What are implicitly defined functions?

- See class explanation

- We learn implicit differentiation with the help of examples.

See examples 1, 2, 3, 4, 5, 6, 7, 8 done in class

See example 8 to understand meaning of

orthogonal curves

Differentiation formulas for inverse trigonometric functions

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

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

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

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

- $$\frac{d}{dx}(\sec^{-1} u) = \frac{1}{u\sqrt{u^2-1}} \cdot \frac{du}{dx}$$

- $$\frac{d}{dx}(\csc^{-1} u) = -\frac{1}{u\sqrt{u^2-1}} \cdot \frac{du}{dx}$$

See examples 9, 10, 11 done in class

Usually

useful

when

3.5₃

Higher order derivatives of implicitly defined functions

See example 12 done in class

To learn how to find higher order derivatives for implicitly defined functions.

End of 3.5