

Learning outcomes

After completing this section, you will inshaAllah be able to

1. find higher order derivatives of
 - a. explicitly defined functions
 - b. implicitly defined functions

Higher order derivatives: Introduction & Computations

- Given a function $f(x)$.
- Then its derivative $f'(x)$ is again a function of x
- So we can differentiate $f'(x)$ further.
- This leads to the idea of higher order derivatives of $f(x)$.

- Given $f(x)$. Then

- $f'(x) = \frac{d}{dx}(f(x))$ 1st derivative of $f(x)$

- $f''(x) = \frac{d}{dx}(f'(x))$ 2nd derivative of $f(x)$

- $f'''(x) = \frac{d}{dx}(f''(x))$ 3rd derivative of $f(x)$

⋮

- $f^{(k)}(x) = \frac{d}{dx}(f^{(k-1)}(x))$ kth derivative of $f(x)$

Other notations

- $y', y'', \dots, y^{(k)}$
- $\frac{dy}{dx}, \frac{d^2y}{dx^2}, \frac{d^3y}{dx^3}, \dots$
- $D, D^2, D^3, \dots$

- We learn computations and concept with the help of examples.

See examples 1, 2, 3, 4, 5, 6, 7, 8, 9 done in class

See example 2 to learn how to find higher order derivatives for implicitly defined functions.

End of 3.7