August 16 Math 2306 sec. 51 Fall 2021

Section 1: Concepts and Terminology

Suppose $y = \phi(x)$ is a differentiable function. We know that $dy/dx = \phi'(x)$ is another (related) function.

For example, if y = cos(2x), then y is differentiable on $(-\infty, \infty)$. In fact,

$$\frac{dy}{dx} = -2\sin(2x).$$

Even dy/dx is differentiable with $d^2y/dx^2 = -4\cos(2x)$.

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A differential equation

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The equation

$$\frac{d^2y}{dx^2} + 4y = 0.$$

is an example of a differential equation.

Questions: If we only started with the equation, how could we determine that cos(2x) satisfies it? Also, is cos(2x) the only possible function that *y* could be?

yes



A **Differential Equation** is an equation containing the derivative(s) of one or more dependent variables, with respect to one or more indendent variables.

Solving a differential equation refers to determining the dependent variable(s)—as function(s).

Independent Variable: will appear as one that derivatives are taken with respect to.

Dependent Variable: will appear as one that derivatives are taken of.

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Independent and Dependent Variables

Often, the derivatives indicate which variable is which:



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