



# Differential Equations

Section 1 - Introduction to Differential Equations

Section 2 - Euler's Method

Section 3 - Separable Differential Equations

Section 4 - Linear 1<sup>st</sup> Order Differential Equations

Section 5 – 2<sup>nd</sup> Order Homogeneous Differential Equations

Section 6 – 2<sup>nd</sup> Order Non-Homogeneous Differential Equations

Section 7 – Reducible Differential Equations

Section 8 - Exact Differential Equations

Section 9 - Laplace Transforms

Section 10 - Methods of Laplace Transforms

Section 11 – Series Solutions to Differential Equations

## Section 1 - Introduction to Differential Equations

Starting Differential Equations

Differential Equations Solutions

Direction Fields

## Section 2 - Euler's Method

Starting Euler's Method

Solving Differential Equations using Euler's Method

## Section 3 - Separable Differential Equations

Solving Separable Differential Equations

Solving Using a Change of Variable Substitution

Initial Value Problems

## Section 4 - Linear 1<sup>st</sup> Order Differential Equations

Starting Linear First-Order Differential Equations

Linear First-Order Differential Equations Using an Integrating Factor

Initial Value Problems



## **Section 5 – 2<sup>nd</sup> Order Homogeneous Differential Equations**

Characteristic Equation with Distinct Real Roots  
Characteristic Equation with Equal Roots  
Characteristic Equation with Complex Roots  
Initial Value Problems  
Boundary value problems

## **Section 6 – 2<sup>nd</sup> Order Non-Homogeneous Differential Equations**

Method of Undetermined Coefficients  
Method of Variation of Parameters  
Variation of parameters with a system of equations  
Variation of parameters with Cramer's rule  
Initial value problems

## **Section 7 – Reducible Differential Equations**

Classes will be updated shortly

## **Section 8 - Exact Differential Equations**

Exact differential equations  
Exact differential equations initial value problems

## **Section 9 - Laplace Transforms**

Laplace transforms using the definition  
Laplace transforms using the table

## **Section 10 - Methods of Laplace Transforms**

Laplace transforms and initial value problems  
Laplace transforms and integration by parts  
Inverse Laplace transforms  
Non-Constant coefficients  
Step functions & initial value problems

## **Section 11 – Series Solutions to Differential Equations**

Taylor Series  
Taylor Series Solutions