Calculus
Chap. 6 section 6
Targets with examples

Name: _____
Date: _____
Period: _____

Solving Differential Equations

Challenging problems can be solved with differential equations.

6D Understanding Procedures to Solve Differential Equations

1. Separate variables in order to find solutions
2. Use Euler's Method to approximate solutions*

[6.2] 39 - 44 {6D.1}
[6.6] 25 & 26 {6D.2}

Separate variables in order to find solutions

Sample Question	Solve the following differential equation by separating variables $\frac{dy}{dx} = \frac{x^2}{y}$
Sample Response	Show / Hide Answer Solve the following differential equation by separating variables $\frac{dy}{dx} = \frac{x^2}{y}$ $y \cdot dy = x^2 dx$ $\frac{y^2}{2} = \frac{x^3}{3}$ $y^2 = \frac{2x^3}{3}$ $y = \pm\sqrt{\frac{2x^3}{3}} + C$

Use Euler's Method to approximate solutions*

Sample Question	Find the first three approximations y_1, y_2, y_3 using Euler's method for the initial value problem $y' = 1+y,\ y(0) = 1$ starting at $x_0 = 0$ with $dx = 0.1$
Sample Response	Show / Hide Answer Solution: $x_0 = 0,\ y_0 = 1$ $x_1 = x_0 + dx = 0.1$ $x_2 = x_0 + 2dx = 0.2$ $x_3 = x_0 + 3dx = 0.3$ *First:* $y_1 = y_0 + f(x_0, y_0)dx$ $= y_0 + (1 + y_0)dx$ $= 1 + (1 + 1)(0.1) = 1.2$ *Second:* $y_2 = y_1 + f(x_1, y_1)dx$ $= y_1 + (1 + y_1)dx$ $= 1.2 + (1 + 1.2)(0.1) = 1.42$ *Third:* $y_3 = y_2 + f(x_2, y_2)dx$ $= y_2 + (1 + y_2)dx$ $= 1.42 + (1 + 1.42)(0.1) = 1.662$