

Math 217 - August 31, 2010

Solutions

- Welcome: Syllabus, instructors, TA, policies
 - <http://www.dehn.wustl.edu/~blake/m217/>
 - Differential equations
1. What is a differential equation?
 2. What is an *ordinary* differential equation?
 3. What is a *partial* differential equation?
 4. What does it mean to *solve* a differential equation?
 5. Does every differential equation have a solution?
 6. What is an initial value problem?

Lecture Problems

7. Which of the following are solutions to the differential equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0$$

- (a) $y = 8e^{3x}$ YES!
- (b) $y = 8xe^{3x}$ YES!
- (c) $y = (3 + 8x)e^{3x}$ YES!
- (d) $y = 8e^{-3x}$ NO!
- (e) $y = 8xe^{-3x}$ NO!
- (f) $y = (3 + 8x)e^{-3x}$ NO!

8. Which of the following are solutions to the differential equation

$$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$$

- (a) $y = 8e^{3x}$ NO!
- (b) $y = 8xe^{3x}$ NO!
- (c) $y = (3 + 8x)e^{3x}$ NO!
- (d) $y = 8e^{-3x}$ YES!
- (e) $y = 8xe^{-3x}$ YES!
- (f) $y = (3 + 8x)e^{-3x}$ YES!

9. Solve the initial value problems

(a)

$$\frac{d^2y}{dx^2} = 6x - 1; \quad y(0) = 2, y'(0) = -11$$

Solution: $y = x^2 - \frac{x^2}{2} - 11x + 2$

(b)

$$\frac{d^2y}{dx^2} = 6x - 1; \quad y(0) = 0, y'(0) = 0$$

Solution: $y = x^2 - \frac{x^2}{2}$

(c)

$$\frac{d^2y}{dx^2} = 6x - 1; \quad y(1) = 0, y'(1) = 0$$

Solution: $y = x^2 - \frac{x^2}{2} - 2x + \frac{3}{2}$

10. What is the *general solution* to

$$\frac{d^2y}{dx^2} = 6x - 1$$

Solution: $y = x^2 - \frac{x^2}{2} - c_1x + c_2$