Math 217 - September 13, 2010

- Substitution: Homogeneous, Bernoulli
- Exact equations

1. Transform the equation with the substitution $v = y/x$.

$$\frac{dy}{dx} = \frac{x^2 + y^2}{2x^2}$$

2. Transform the equation with the substitution $v = y^{-1}$. (Note both lines below are the same equation, just rearranged.)

$$\begin{aligned} \frac{dy}{dx} + \frac{4}{x}y &= x^3y^2 \\ y^{-2}\frac{dy}{dx} + \frac{4}{x}y^{-1} &= x^3 \end{aligned}$$

3. Solve the previous equations.

   (a)

$$\frac{dy}{dx} = \frac{x^2 + y^2}{2x^2}$$

   (b)

$$\frac{dy}{dx} + \frac{4}{x} = x^3y^2$$

4. Compute the line integral along a curve C from $(1, 2)$ to $(-1, 3)$.

$$\int_{(1,2)}^{(-1,3)} y^3\,dx + 3xy^2\,dy =$$

Lecture Problems

5. Solve the Bernoulli equation

$$x\frac{dy}{dx} + 5y = 2x^2y^4$$

6. Solve the exact equations

   (a)

$$(3xy - 3x^2)\,dx + (x^2 - 2y)\,dy = 0$$

   (b)

$$(y^2 + 1)\,dx + yx\,dy = 0$$

   (c)

$$\cos y\,dx + (y^2 - x\sin y)\,dy = 0$$