Math 217 Fall, 2023
Krantz September 20, 2023

PRACTICE EXAM FOR FIRST MIDTERM EXAM

(8 points) **1.** Solve the differential equation

$$y' = x^2 y\,.$$

(8 points) **2.** Solve the first-order linear equation

$$y' - x \cdot y = 2x\,.$$

(10 points) **3.** Solve the initial value problem

$$\begin{aligned} y' - (1/x)y &= x^3 \\ y(2) &= 3\,. \end{aligned}$$

(8 points) **4.** Solve the exact equation

$$(x^3 + y)dx + (y^4 + x)dy = 0\,.$$

(8 points) **5.** Find the family of orthogonal trajectories to the curves $y = cx^3$.

(8 points) **6.** Use the method of homogeneous equations to solve

$$(x + y)dx + (y - x)dy = 0\,.$$

(8 points) **7.** The equation

$$(3x^3y^2 - x\cos y)dx + (2x^4y + x^2\sin y)dy = 0$$

is *not* exact. Find an integrating factor for this equation.

(8 points) **8.** Use the method of reduction of order to solve the differential equation

$$y'' + xy' = 2x\,.$$

(10 points) **9.** Find the solution of the exact equation

$$4xydx + 2x^2dy = 0$$

that satisfies $y = 2$ when $x = 1$.

(8 points) **10.** Use reduction of order to solve the differential equation

$$y'' = -y'$$

with initial conditions $y(1) = 2$ and $y'(1) = 3$.

(8 points) **11.** Solve the initial value problem

$$y' - xy = 3x \quad , \quad y(1) = 2\,.$$

(8 points) **12.** Solve the differential equation

$$y' = x^3 y\,.$$