

Name:

Perm number:

Midterm – in-class part

Time: 75 minutes

1. **(25 points)** Find all solutions to the equation

$$\frac{dy}{dx} = 2xy^2 - x^2 \frac{dy}{dx}.$$

2. **(25 points)** Find all solutions to the equation

$$x \frac{dy}{dx} - y = 2x^3.$$

3. **(25 points)** Find all solutions to the equation

$$4x^3 + 6xy^3 + (9x^2y^2 + 3)\frac{dy}{dx} = 0.$$

4. **(25 points)** The function

$$y(x) = \frac{12x + 7}{144}$$

is one of the solutions to the equation

$$y'' - 7y' + 12y = x.$$

Find a solution that satisfies $y(0) = 3\frac{7}{144}$ and $y'(0) = 11\frac{12}{144}$.

5. **(bonus 25 points)** Find all solutions to the equation

$$(1 - x^2y) + x^2(y - x)\frac{dy}{dx} = 0.$$