

UNIVERSITY OF REGINA
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 281 200610 Quiz 1
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(marks) Please do questions 1 and 2. You have 10 minutes to do each question, and 10 minutes to check your work, for a total of 30 minutes for the quiz. A non-programmable calculator is allowed but is not necessary. If you finish early, I recommend you try question 3.

(10) 1. Verify that the piecewise-defined function

$$y = \begin{cases} -x^3, & x < 0 \\ +x^3, & x \geq 0 \end{cases}$$

is a solution of the differential equation $xy' - 3y = 0$ on the interval $(-\infty, \infty)$.

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Time: 30 minutes

Name: _____
Student #: _____

- (10) 2. Consider the initial value problem

$$y' = y - y^2, \quad y(-1) = 2.$$

Show that $y(x) = 1/(1 + ce^{-x})$ is a general solution to the differential equation. Find a solution to the initial value problem.

- (0) 3. *To amuse yourself if you finish early.*

(a) Solve the separable equation from the previous problem. Are there any 'lost solutions'?

(b) There are at least four qualitatively different families of solutions to the autonomous equation described in the previous problem. Sketch three representative curves from each family if possible. (Hint: if $\phi(x)$ is a solution, $\phi(x + k)$ should also be a solution. What is the connection between k and c ?)