

MTH 204
Quiz 1
16 Jan 2009

Name: Key

Section: C or F (circle one)

Read the directions carefully.

Write neatly in pencil and show all your work
(you will only get credit for what you put on paper).

You may use your homework solutions.

If you get stuck, free feel to ask me for help.

1. Give the order of the following DEs. Determine whether DE is linear or nonlinear. If nonlinear, state why.

a. $\frac{dA}{dt} = 10 - 5A$
200-t

1st order, linear

b. $x^2 y'' + xy' = e^y$

2nd order, nonlinear
nonlinear function of y

c. $x^2 y''' + (1-x)y' = e^x$

3rd order, linear

d. $\frac{d^2 y}{dx^2} + (1-x) \left(\frac{dy}{dx} \right)^3 = \sin(x)$

2nd order, nonlinear
power of $y' \neq 1$

e. $\frac{d^3 y}{dx^3} + (1-y) \frac{dy}{dx} = \tan(x)$

3rd order, nonlinear
Coefficient depends on y.

2. Determine a region R in the xy-plane for which $\frac{dy}{dx} = x^2 + \sqrt{y+x}$ would have a unique solution

whose graph passes through (x_0, y_0) in R.

Sketch the region.

$f(x, y) = x^2 + \sqrt{y+x}$

$\frac{\partial f}{\partial y} = \frac{1}{2\sqrt{y+x}}$

$\frac{\partial f}{\partial x} = \frac{1}{2\sqrt{y+x}}$

$R = \{(x, y) : y+x > 0\}$

$= \{(x, y) : y > -x\}$

