

MTH204

Quiz 1

18 Jan 2008

Name: Key

Section: C&F

Follow the directions carefully.
Please show all your work
neatly in pencil. This quiz is
closed book, closed notes, but
you may your homework
solutions. If you get stuck,
feel free to ask me for help.

1. Find the order of each DE. Determine whether the equation is linear or nonlinear. If nonlinear, state why.

a. $e^x \frac{d^3 y}{dx^3} + (1-x)y' = \tan x$ 3rd, linear

b. $t \frac{d^2 y}{dt^2} + 3 \left(\frac{dy}{dt} \right)^3 = t^2$ 2nd, nonlinear - degree of $y' \neq 1$

c. $6x^2 y'' + 3xy' - 5y = 0$ 2nd, linear

d. $\frac{dP}{dt} = P(a - bP)$ 1st, nonlinear - coefficient on P depends on P

e. $\frac{d^5 y}{dx^5} = e^{2x+y}$ 5th, nonlinear - nonlinear function of y .

2. Given $(4-y^2)y' = x^2$, determine a region in the xy -plane for the DE would have a unique solution through a point (x_0, y_0) . Sketch the region.

$\frac{dy}{dx} = \frac{x^2}{4-y^2} = f(x, y)$

$\frac{\partial f}{\partial y} = \frac{2x^2 y}{(4-y^2)^2}$

$R: \begin{cases} x: \text{all reals} \\ y: (-\infty, -2), (-2, 2), (2, \infty) \end{cases}$

