

MTH 204
Quiz 4
6 Feb 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.

LEAD: Thursdays, 5:00 - 7:00 PM
CSF G5D

Exam1: Friday, 13 Feb
1.1 - 4.

Consider the DE $xy'' + (1-2x)y' + (x-1)y = 0, x > 0$.

a. Do $f(x) = e^x$ and $g(x) = x(x-2)$ form a FSS on $x > 0$? State why or why not.

1. Check if f, g are sol

$$f(x) = e^x, f'(x) = e^x, f''(x) = e^x$$

$$\Rightarrow xe^x + (1-2x)e^x + (x-1)e^x = 0 \Rightarrow f \text{ is a sol}$$

$$g(x) = x^2 - 2x, g'(x) = 2x - 2, g''(x) = 2$$

$$\Rightarrow x(2) + (1-2x)(2x-2) + (x-1)(x^2-2x) = x^3 - 7x^2 + 2x + 2$$

$$\Rightarrow g \text{ is not a sol}$$

$\therefore f, g$ do not form a FSS since g is not a sol.

b. Do $f(x) = e^x$ and $h(x) = e^x \ln x$ form a FSS on $x > 0$? State why or why not.

1. Check if f, h are sol

$$h(x) = e^x \ln x, h'(x) = e^x \ln x + x^{-1}e^x$$

$$h''(x) = e^x \ln x + 2x^{-1}e^x - x^{-2}e^x$$

$$\Rightarrow x[e^x \ln x + 2x^{-1}e^x - x^{-2}e^x] + (1-2x)(e^x \ln x + x^{-1}e^x) + (x-1)e^x \ln x = 0$$

$$\Rightarrow h(x) \text{ is a sol}$$

$$2. \text{ Check LI: } W(f, h) = \begin{vmatrix} e^x & e^x \ln x \\ e^x & e^x \ln x + x^{-1}e^x \end{vmatrix} \neq 0$$

$$\Rightarrow f, h \text{ are LI}$$

3. f, h form a FSS since we have 2 LI sol.