

MTH 204

Quiz 4

19 Sept 2008

Name Key

Section A & C

Follow the directions carefully.

This quiz is closed book, closed notes, but you may use your homework solutions. Please write in pencil. You must show all your work to receive full credit. If you get stuck, feel free to ask me for help.

Thurs: LEAD

5-7, CSFG5D

26 Sept: Exam I

Sec 1.1-

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

a. Do $f(x) = e^x$ and $g(x) = x^2$ form a FSS on $x > 1$?

State why or why not.

$$f(x) = e^x \quad f'(x) = e^x \quad f''(x) = e^x$$

$$\text{LHS: } (x-1)e^x - xe^x + e^x = 0 \quad \Rightarrow f(x) \text{ is a solution}$$

$$\text{RHS: } 0$$

$$g(x) = x^2 \quad g'(x) = 2x \quad g''(x) = 2$$

$$\text{LHS: } (x-1)(2) - x(2x) + x^2 = -x^2 + 2x - 2 \quad \Rightarrow g(x) \text{ is not}$$

$$\text{RHS: } 0$$

a solution

Since $g(x)$ is not a solution, $f(x)$ and $g(x)$ do not form a FSS

b. Do $f(x) = e^x$ and $h(x) = x$ form a FSS on $x > 1$?

State why or why not.

$f(x)$ is a solution

$$h(x) = x \quad h'(x) = 1 \quad h''(x) = 0$$

$$\text{LHS: } (x-1)(0) - x(1) + x = 0 \quad \Rightarrow h(x) \text{ is a solution}$$

$$\text{RHS: } 0$$

$$W(f, h) = \begin{vmatrix} e^x & x \\ e^x & 1 \end{vmatrix} = e^x - xe^x \neq 0 \Rightarrow f, h \text{ are LI on } x > 1$$

Since we have 2 LI solutions for a 2nd order DE, $f(x)$ and $h(x)$ form a FSS.

Bonus (2 pts): What's the difference between a general solution and a superposition? (Be specific).