Quiz 3 SHOW ALL WORK Oct 12, 2018

1.) The solution to $y'' + 16y = 36cos(2t)$ is $y = c_1cos(4t) + c_2sin(4t) + 3cos(2t)$
Use this fact to answer the following two questions.

[5] 1a.) Guess a possible non-homog soln for the following differential equation (do not solve): $y'' + 16y = 3sin(4t) - e^{4t}$

Guess $y = t[Asin(4t) + Bcos(4t)] + Ce^{4t}$

For explanations and examples,
see http://homepage.divms.uiowa.edu/~idarcy/COURSES/100/3_5listSans.pdf
and http://homepage.divms.uiowa.edu/~idarcy/COURSES/100/3_5exA.pdf

[3] 1b.) The general solution to $y'' + 16y = 36cos(2t) + 32$ is

$y = c_1cos(4t) + c_2sin(4t) + 3cos(2t) + 2$

See http://homepage.divms.uiowa.edu/~idarcy/COURSES/100/FALL18/18_10_15.pdf

2.) Circle T for true and F for false.

[2] 2a.) $L(f) = af'' + bf' + cf$ is a linear function on the space of all twice differentiable functions.

T

[2] 2b.) $L(f) = af'' + bf' + cf^2$ is a linear function on the space of all twice differentiable functions.

F

[2] 2c.) Suppose $y = \phi_1(t)$ and $y = \phi_2(t)$ are solutions to $ay'' + by' + cy = 0$,
$y = \psi_1(t)$ is a solution to $ay'' + by' + cy = g_1(t)$, and
$y = \psi_2(t)$ is a solution to $ay'' + by' + cy = g_2(t)$, then the **general** solution to
$ay'' + by' + cy = g_1(t) + g_2(t)$ is $y = c_1\phi_1(t) + c_2\phi_2(t) + \psi_1(t) + \psi_2(t)$.

F

[2] 2c.) Suppose $y = \phi_1(t)$ and $y = \phi_2(t)$ are solutions to $ay'' + by' + cy = 0$,
$y = \psi_1(t)$ is a solution to $ay'' + by' + cy = g_1(t)$, and
$y = \psi_2(t)$ is a solution to $ay'' + by' + cy = g_2(t)$, then $y = c_1\phi_1(t) + c_2\phi_2(t) + \psi_1(t) + \psi_2(t)$ is also a solution to
$ay'' + by' + cy = g_1(t) + g_2(t)$.

T

[2] 2c.) Suppose $y = \phi_1(t)$ and $y = \phi_2(t)$ are linearly **independent solutions** to $ay'' + by' + cy = 0$,
$y = \psi_1(t)$ is a solution to $ay'' + by' + cy = g_1(t)$, and
$y = \psi_2(t)$ is a solution to $ay'' + by' + cy = g_2(t)$, then the general solution to
$ay'' + by' + cy = g_1(t) + g_2(t)$ is $y = c_1\phi_1(t) + c_2\phi_2(t) + \psi_1(t) + \psi_2(t)$.

T

Note for 2c, I forgot to include linearly independent, so if lost 2 points because I graded your problem incorrectly, please let me know.

[2] 2d.) $\Sigma_{n=2}^{\infty} n(n-1)a_n x^{n-2} = \Sigma_{j=0}^{\infty}(j+2)(j+1)a_{j+2}x^j = \Sigma_{n=0}^{\infty}(n+2)(n+1)a_{n+2}x^n$

T

[2] 2e.) Suppose $f(x) = \Sigma a_n(x-3)^n$ has a radius of convergence $= r$ about the point $x_0 = 3$. Then we can define the domain of f to be $(3-r, 3+r)$.

T

[2] 2f.) Suppose $f(x) = \Sigma a_n(x+1)^n$ has a radius of convergence $= 4$ about the point $x_0 = -1$. Then we can define the domain of f to be $(-5, 3)$.

T