

Math 3325 Quiz #7
FALL SEMESTER 2009

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Name SOLUTIONS

1. Find the annihilators for each of the following functions:

(a) $f(x) = x^2 e^{-x} \cos 3x$

$$L = (D^2 + 2D + 10)^3$$

(b) $f(x) = \frac{1}{3}x - \sin x$

$$L = D^2(D^2 + 1)$$

2. Find the best possible form of a particular solution to each of the following non-homogeneous differential equations. You need not solve for the constants in your best possible form.

(a) $(D - 1)^2(D^2 + D + 3)y = x^3 e^x$

$$y_p(x) = (c_1 x^2 + c_2 x^3 + c_3 x^4 + c_4 x^5) e^x$$

(b) $(D + 1)^3(D - 3)^2 = 1 + e^{-x}$.

$$y_p(x) = c_1 + c_2 x^3 e^{-x}$$

3. Find a particular solution to the differential equation

$$(D^2 - 4)y = e^{2x}.$$

$$y_p(x) = c x e^{2x}$$

$$y_p'(x) = c e^{2x} + 2c x e^{2x}$$

$$y_p''(x) = 2c e^{2x} + 2c e^{2x} + 4c x e^{2x} = 4c x e^{2x} + 4c e^{2x}$$

$$\therefore 4c x e^{2x} + 4c e^{2x} - 4c x e^{2x} = e^{2x}$$

$$\Rightarrow 4c = 1 \text{ so } c = 1/4$$

$$\therefore \boxed{y_p(x) = \frac{1}{4} x e^{2x}}$$