

Math 3325 Quiz #6
FALL SEMESTER 2009

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Name SOLUTIONS

1. Find the general solution to each of the following differential equations:

(a) $y''' + 5y'' + 6y' = 0$.

The characteristic equation is $d^3 + 5d^2 + 6d = 0$

ie. $0 = d(d^2 + 5d + 6) = d(d+3)(d+2)$

∴ general solution is $y(x) = c_1 + c_2 e^{-3x} + c_3 e^{-2x}$.

(b) $y'' - 2y' + 5y = 0$.

$d^2 - 2d + 5 = 0 \Rightarrow d = \frac{2 \pm \sqrt{4 - 4(5)}}{2} = \frac{2 \pm 4i}{2} = 1 \pm 2i$

∴ general solution is

$y(x) = c_1 e^x \cos 2x + c_2 e^x \sin 2x$

(c) $y'' + 6y' + 9y = 0$.

$0 = d^2 + 6d + 9 = (d+3)^2$

∴ general solution is $y(x) = c_1 e^{-3x} + c_2 x e^{-3x}$.

(d) $y^{(4)} = 0$.

$y(x) = c_1 + c_2 x + c_3 x^2 + c_4 x^3$

(e) $(D+1)^2(D-2)^3(D^2-1)^3 y = 0$.

∴
 $(D+1)^5(D-2)^3(D-1)^3 y = 0$

∴ general solution is

$y(x) = (c_1 + c_2 x + c_3 x^2 + c_4 x^3 + c_5 x^4) e^{-x}$
 $+ (c_6 + c_7 x + c_8 x^2) e^{2x}$
 $+ (c_9 + c_{10} x + c_{11} x^2) e^x$