

## 2012 Mathematics (2)

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### Section A

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## **Section B**

**11X**

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**12W**

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**13Z**

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***Solution(s):***

From user: ar857

2012 II 13

a)  $y'' + y' - 2y = 0$

$$\lambda^2 + \lambda - 2 = 0 \quad (\lambda + 2)(\lambda - 1) \Rightarrow \lambda = -2 \quad \lambda = 1$$

$$y_c = c_1 e^{-2x} + c_2 e^{x}$$

$$y'(0) = -2c_1 + c_2 = -1$$

$$-2c_1 + 2c_1 + c_2 + 2c_2 = -1 + 2$$

$$y(0) = c_1 + c_2 = 1$$

$$c_2 = \frac{1}{3} \quad c_1 = \frac{2}{3}$$

$$y = \frac{2}{3} e^{-2x} + \frac{1}{3} e^x$$

b)  $y'' + 6y' + 9y = 1 + 3x$

$$\lambda^2 + 6\lambda + 9 = (\lambda + 3)^2$$

$$y_c = c_1 e^{-3x} + x c_2 e^{-3x}$$

$$y_p = kx + b$$

$$y'p = k$$

$$Ly = 0 + 6k + 9kx + 9b = 1 + 3x$$

all 0

$$k = \frac{1}{3}$$

$$b = -\frac{1}{9}$$

$$y = c_1 e^{-3x} + x c_2 e^{-3x} + \left( \frac{1}{3}x - \frac{1}{9} \right)$$

c)  $y'' + 3y' + 2y = x + e^{3x}$

$$\lambda^2 + 3\lambda + 2 = (\lambda + 2)(\lambda + 1) \Rightarrow \lambda = -2 \quad \lambda = -1$$

$$y_c = c_1 e^{-2x} + c_2 e^{-x}$$

$$y_{p1} = kx + b$$

$$Ly_{p1} = 0 + 3k + 2kx + b = x \quad k = \frac{1}{2} \quad b = -\frac{3}{4} \quad y_{p1} = \frac{1}{2}x - \frac{3}{4}$$

$$y_{p2} = H e^{3x}$$

$$Ly_{p2} = H e^{3x} \cdot (9 + 9 + 2) \Rightarrow H = \frac{1}{20}$$

$$y = c_1 e^{-2x} + c_2 e^{-x} + \frac{1}{20} e^{3x} + \frac{1}{2}x - \frac{3}{4}$$

14S

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15T

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**16Y**

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**Solution(s):**

From user: ar857

Handwritten solution for problem 16Y:

2012 16 2

headendung: a)  $\frac{dF}{dt} = 3x^2yz \frac{dx}{dt} + y^3 \frac{dz}{dt} + x^3z \frac{dy}{dt} + x^3y \frac{dz}{dt} + \frac{dF}{dt}$

$= (3x^2yz + y^3) \cdot 3 \sin z + (x^3z + x) \cdot 3 \cos z + (x^3y + 1) \cdot 2$

$= -(3x^2yz + y^3) \cdot 3 + 2x^3y + 2 = 2x^3y - 9x^2yz - 3y + 2$

$= -9 + 2 = -7$

b)  $x - 2y = x - ay \quad a = 2$

c)  $(x^2 + xy - y^2) dx + (2x - 2xy) dy = 0$

$\frac{1}{3}x^3 + \frac{1}{2}x^2y - xy^2 = C$

**17S**

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**18R**

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**19Z\***

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**20T\***

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