

1. Simplify:

- (a)  $e^{2i}$   
 (b)  $3e^i$   
 (c)  $2e^{i/2}$   
 (d)  $4e^{3i/2}$   
 (e)  $e^{i/4}$

Answers: (a) 1 (b) -3 (c) 2i  
 (d) -4i (e)  $2/2 + i$   $2/2$

2. Find the general solution

- (a)  $y''(t) - 4y'(t) + 4y(t) = 0$   
 (b)  $y''(t) - 6y'(t) + 13y(t) = 0$   
 (c)  $y''(t) + 6y'(t) + 9y(t) = 0$   
 (d)  $y''(t) - 4y'(t) + 5y(t) = 0$

Ans

- (a)  $y = A e^{2t} + B t e^{2t}$   
 (b)  $y = A e^{3t} \cos(2t) + B e^{3t} \sin(2t)$   
 (c)  $y = A e^{-3t} + B t e^{-3t}$   
 (d)  $y = A e^{2t} \cos(t) + B e^{2t} \sin(t)$

3. Find the solution

- (a)  $y''(t) - 4y'(t) + 4y(t) = 0, y(0) = 3, y'(0) = 8$   
 (b)  $y''(t) - 6y'(t) + 13y(t) = 0, y(0) = 4, y'(0) = 22$   
 (c)  $y''(t) + 6y'(t) + 9y(t) = 0, y(0) = 4, y'(0) = -11$   
 (d)  $y''(t) - 4y'(t) + 5y(t) = 0, y(0) = 1, y'(0) = -1$

Ans.

- (a)  $y = 3 e^{2t} + 2 t e^{2t}$   
 (b)  $y = 4 e^{3t} \cos(2t) + 5 e^{3t} \sin(2t)$   
 (c)  $y = 4 e^{-3t} + t e^{-3t}$   
 (d)  $y = e^{2t} \cos(t) - 3 e^{2t} \sin(t)$

4. Find

- (a)  $(2 \sin(3x) - 4 \cos(5x)) dx$   
 (b)  $(3 \sin(5x) + 2 \cos(7x-1)) dx$   
 (c)  $(4 e^{2x} - 3x e^{x^2}) dx$

Ans: (a)  $(-2/3) \cos(3x) - (4/5) \sin(5x) + C$ (b)  $(-3/5) \cos(5x) + (2/7) \sin(7x-1) + C$ (c)  $2 e^{2x} - (3/2) e^{x^2} + C$ 5. Suppose that the temperature  $T$  at the point  $(x,y,z)$  is given by

$$T = 3x^2 y^4 \sin(3z).$$

- (a) Find  $T/x$  (b) Find  $T/y$   
 (c) Find  $T/z$  (d) Find  $\frac{\partial T}{\partial x \partial z}$   
 (e) Find  $\frac{\partial^2 T}{\partial z^2}$

Answers: (a)  $6x y^4 \sin(3z)$  (b)  $12 x^2 y^3 \sin(3z)$ (c)  $9 x^2 y^4 \cos(3z)$  (d)  $18 x y^4 \cos(3z)$ (e)  $-27 x^2 y^4 \sin(3z)$