

## Sample Questions Set 05

$$1. \quad 3x + 4 - x^2 = -x^2 + 3x + 4 = -(x^2 - 3x - 4) \\ = -(x - 4)(x + 1)$$

$$2. \quad \underbrace{4x^2 - 1}_{m} = (2x)^2 - 1 \quad \begin{matrix} a^2 - b^2 \\ = (a-b)(a+b) \end{matrix} \\ = (2x+1)(2x-1)$$

$$3. \quad x^4 - 16 = (x^2)^2 - 4^2 = \underbrace{(x^2 - 4)}_{m} (x^2 + 4) \\ = (x^2 - 2^2)(x^2 + 4) = (x+2)(x-2)(x^2 + 4) \\ \swarrow \text{complex roots}$$

$$4. \quad e^{2x} - 5e^x - 6 = (e^x)^2 - 5e^x - 6 \leftarrow \begin{matrix} \text{quadratic} \\ \text{polynomial} \\ \text{in } e^x \end{matrix} \\ = (e^x + 1)(e^x - 6)$$

OR:  $y = e^x$

$$y^2 - 5y - 6 = (y + 1)(y - 6)$$

$$= (e^x + 1) \cdot (e^x - 6)$$

$$5. \quad x^6 - 7x^3 - 8 = (x^3)^2 - 7x^3 - 8$$

$$= (x^3 + 1)(x^3 - 8)$$

$\underbrace{\hspace{2em}}$ 
 $\underbrace{\hspace{2em}}$

quadratic in  $x^3$

$$x^3 + 1$$

$$x = -1 \text{ (root)}: (-1)^3 + 1 = -1 + 1 = 0$$

$(x+1)$  is a factor of  $x^3+1$ .

$$(x+1)(x^2 - x + 1)$$

complex root

	$x^3$	$x^2$	$x$	const
-1	1	0	0	1
+)	↓			
$\times 1$	1	-1	1	-1
		-1	1	0

$$x^3 - 8$$

$$x = 2 \text{ (root)}: 2^3 - 8 = 0$$

rem = 0

$(x-2)$  is a factor of  $x^3-8$

$$= (x-2)(x^2 + 2x + 4)$$

complex root

	$x^2$	$x$	const
+2	1	0	-8
+)	↓		
$\times 1$	1	2	4
		2	4
			0

$$x^6 - 7x^3 - 8 = (x^3 + 1)(x^3 - 8)$$

rem = 0

$$= (x+1)(x^2 - x + 1)(x-2)(x^2 + 2x + 4)$$

$$= (x+1)(x-2)(x^2 - x + 1)(x^2 + 2x + 4)$$