

## ΑΝΑΛΥΣΗ ΣΕ ΓΙΝΟΜΕΝΟ ΠΡΩΤΩΝ ΠΑΡΑΓΟΝΤΩΝ

### Ενδεικτικές Επαναληπτικές Δραστηριότητες 1

A) Να αναλύσετε σε γινόμενο πρώτων παραγόντων τις πιο κάτω παραστάσεις:

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

$$2) 4x - 16 = 4(x-4)$$

$$3) 16x^2 - 4x = 4x(4x-1)$$

$$4) 25x^4 + 10x^2 + 15 = 5(5x^4 + 2x^2 + 3)$$

$$5) x^3 - x = x(x^2 - 1) = x(x-1)(x+1)$$

$$6) 25w^2 - 16 = (5w-4)(5w+4)$$

$$7) \underbrace{ax - a\psi}_{\text{common factor}} - \underbrace{3x + 3\psi}_{\text{common factor}} = a(\cancel{x} - \cancel{\psi}) - 3(\cancel{x} + \cancel{\psi}) = (x - \psi)(a - 3)$$

$$8) x^2 - 6x - 27 = (x-9)(x+3)$$

$$9) \frac{x^2}{9} - 1 = \left(\frac{x}{3} - 1\right)\left(\frac{x}{3} + 1\right)$$

$$10) \underbrace{a\beta - 4\beta + a\gamma}_{\text{common factor}} - \underbrace{4\gamma - 4\gamma}_{\text{cancel}} = a(b+\gamma) - 4(b+\gamma) = (b+\gamma)(a-4)$$

$$11) 3x^2 - 27 = 3(x^2 - 9) = 3(x-3)(x+3)$$

$$12) 2a^3 + 54 = 2(a^3 + 27) = 2(a+3)(a^2 - 3a + 9)$$

$$13) x^5 + x^4 - 2x^3 = x^3(x^2 + x - 2) = x^3(x+2)(x-1)$$

$$14) 1 + 9x^2 + 6x = (3x+1)^2$$

$$15) 16\alpha^3\beta^4 - 12\alpha^5 = 4\alpha^3(4\beta^4 - 3\alpha^2)$$

$$16) \alpha^5 - \alpha^2 = \alpha^2(\alpha^3 - 1) = \alpha^2(\alpha - 1)(\alpha^2 + \alpha + 1)$$

$$17) 2\alpha^{20} - 32\alpha^{16} = 2\alpha^{16}(\alpha^4 - 16) = 2\alpha^{16}(\alpha^2 + 4)(\alpha^2 - 4) = 2\alpha^{16}(\alpha^2 + 4)(\alpha - 2)(\alpha + 2)$$

$$18) 2\alpha^3 + 8\alpha^2 + 8\alpha = 2\alpha(\alpha^2 + 4\alpha + 4) = 2\alpha(\alpha + 2)^2$$

$$19) 3(x - \psi) + 6\psi(\psi - x) = 3\underbrace{(x - \psi)}_{(x - \psi)} - 6\psi\underbrace{(x - \psi)}_{(x - \psi)} = (x - \psi)(3 - 6\psi) = 3(x - \psi)(1 - 2\psi)$$

$$20) x^{2012} - x^{2015} = x^{2012}(1 - x^3) = x^{2012}(1 - x)(1 + x + x^2)$$

B) Να αναλύσετε πλήρως σε γινόμενο παραγόντων.

$$\begin{aligned} 1) \quad \alpha\beta(x^2 + \psi^2) + \chi\psi(\alpha^2 + \beta^2) &= \overbrace{\alpha\beta x^2 + \alpha\beta\psi^2 + \chi\psi\alpha^2 + \chi\psi\beta^2}^{\text{παραγόντων}} \\ &= \alpha x(\underbrace{\beta x + \alpha\psi}_{\text{παραγόντων}}) + \beta\psi(\underbrace{\alpha\psi + \chi b}_{\text{παραγόντων}}) \\ &= (\beta x + \alpha\psi)(\alpha x + \beta\psi) \end{aligned}$$

$$\begin{aligned} 2) \quad (\alpha + 1)^2 - 9 &= [(a+1) - 3][(a+1) + 3] \\ &= (a+1-3)(a+1+3) \\ &= (a-2)(a+4) \end{aligned}$$

$$\begin{aligned} 3) \quad \underbrace{x^3 - \psi^3}_{\text{παραγόντων}} + \underbrace{x^2 - \psi^2}_{\text{παραγόντων}} &= (x - \psi)(x^2 + x\psi + \psi^2) + (x - \psi)(x + \psi) \\ &= (x - \psi)(x^2 + x\psi + \psi^2 + x + \psi) \end{aligned}$$

$$\begin{aligned} 4) \quad \underbrace{\alpha\beta + \alpha + 2\beta + \beta^2 + 1}_{\text{παραγόντων}} &= a(\underbrace{b+1}_{\text{παραγόντων}}) + (\underbrace{b+1}_{\text{παραγόντων}})^2 \\ &= (b+1)[a + (b+1)] \\ &= (b+1)(a+b+1) \end{aligned}$$

$$\begin{aligned} 5) \quad \underbrace{3x^5 + 9x^4 + 2x^3 + 6x^2 + x + 3}_{\text{παραγόντων}} &= 3x^4\underbrace{(x+3)}_{\text{παραγόντων}} + 2x^2\underbrace{(x+3)}_{\text{παραγόντων}} + 1\underbrace{(x+3)}_{\text{παραγόντων}} \\ &= (x+3)(3x^4 + 2x^2 + 1) \end{aligned}$$

$$\begin{aligned}
 6) \quad (x - \psi)^2 - (x + \psi)^2 &= [(x - \psi) - (x + \psi)][(x - \psi) + (x + \psi)] \\
 &= (x - \psi - x - \psi)(x - \psi + x + \psi) \\
 &= -2\psi \cdot 2x \\
 &= -4x\psi
 \end{aligned}$$

$$\begin{aligned}
 7) \quad (2\omega + 4)(\omega^2 - 1) - (3\omega + 6)(\omega - 1)^2 &= 2(\underbrace{\omega + 2}_{\omega+2})(\underbrace{\omega - 1}_{\omega-1})(\underbrace{\omega + 1}_{\omega+1}) - 3(\underbrace{\omega + 2}_{\omega+2})(\underbrace{\omega - 1}_{\omega-1})^2 \\
 &= (\omega + 2)(\omega - 1)[2(\omega + 1) - 3(\omega - 1)] \\
 &= (\omega + 2)(\omega - 1)(2\omega + 2 - 3\omega + 3) \\
 &= (\omega + 2)(\omega - 1)(5 - \omega)
 \end{aligned}$$

$$\begin{aligned}
 8) \quad x^2 + 4x - 36\alpha - 12 + \alpha x^2 &= (x + 6)(x - 2) - \alpha(36 - x^2) \\
 &= (x + 6)(x - 2) - \alpha(6 - x)(6 + x) \\
 &= (x + 6)[(x - 2) - \alpha(6 - x)] \\
 &= (x + 6)(x - 2 - 6\alpha + \alpha x)
 \end{aligned}$$

$$\begin{aligned}
 9) \quad \alpha^2 - \beta^2 - \gamma^2 - 10\alpha + 25 + 2\beta\gamma &= (\alpha^2 - 10\alpha + 25) - (\beta^2 - 2\beta\gamma + \gamma^2) \\
 &= (\alpha - 5)^2 - (\beta - \gamma)^2 \\
 &= [(\alpha - 5) - (\beta - \gamma)][(\alpha - 5) + (\beta - \gamma)] \\
 &= (\alpha - 5 - \beta + \gamma)(\alpha - 5 + \beta - \gamma)
 \end{aligned}$$

$$\begin{aligned}
 10) \quad \underbrace{100\omega^3 + 100\omega^2}_{\omega^2} - \underbrace{\omega - 1}_{\omega-1} &= 100\omega^2(\underbrace{\omega + 1}_{\omega+1}) - 1(\underbrace{\omega + 1}_{\omega+1}) \\
 &= (\omega + 1)(100\omega^2 - 1) \\
 &= (\omega + 1)(10\omega - 1)(10\omega + 1)
 \end{aligned}$$