

CEM – Yr 12 – Polynomials – MC – Paper 1

1) If $P(x) = x^3 + 5x^2 + 3x - 9$ has a repeated zero, factor $P(x)$ over the real numbers.

(a) $(x-1)^2(x+3)$

(b) $(x+1)(x-3)^2$

(c) $(x-1)(x+3)^2$

(d) $(x+1)^2(x-3)$

2) If α, β, γ are the roots of the equation $x^3 + 4x^2 - 4 = 0$, find the value of

$$\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}.$$

(a) -1

(b) 0

(c) 1

(d) 2

Use the following information to answer questions 3 and 4.

The cubic equation $x^3 - x^2 + 4x - 2 = 0$ has roots α, β and γ .

3) Find the equation whose roots are α^2, β^2 and γ^2 .

(a) $x^3 + 14x^2 - 7x - 12 = 0$

(b) $x^3 - 14x^2 + 14x - 1 = 0$

(c) $x^3 + 7x^2 + 12x - 4 = 0$

(d) $x^3 + 14x + 8 = 0$

4) Find the value of $\alpha^2\beta^2 + \alpha^2\gamma^2 + \beta^2\gamma^2$.

(a) 84

(b) -48

(c) 12

(d) 4

5) The equation $x^3 - 2x^2 + 1 = 0$ has 3 roots α, β and γ . Form a cubic equation with roots $\alpha + \beta, \alpha + \gamma, \beta + \gamma$.

(a) $x^3 - 4x^2 + 4x - 1 = 0$

(b) $x^3 - 8x^2 + 8x - 1 = 0$

(c) $x^3 + 4x^2 - 4x + 1 = 0$

(d) $x^3 + 8x^2 - 8x + 1 = 0$

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Use the following information for questions 6 and 7.

Let α, β and γ be the roots of $x^3 - 7x^2 + 18x - 7 = 0$.

6) Find a cubic equation that has roots $1 + \alpha^2, 1 + \beta^2, 1 + \gamma^2$.

(a) $x^3 + 16x^2 + 255x - 289 = 0$

(b) $x^3 - 8x^2 + 155x - 49 = 0$

(c) $x^3 + 25x^2 + 169x - 64 = 0$

(d) $x^3 - 64x^2 + 289x - 255 = 0$

7) Find the value of $(1 + \alpha^2)(1 + \beta^2)(1 + \gamma^2)$.

(a) 49

(b) 255

(c) 64

(d) 289

8) Let α, β, γ be the roots of $x^3 + qx + r = 0$.

Evaluate $(\alpha + \beta - \gamma)(\beta + \gamma - \alpha)(\gamma + \alpha - \beta)$.

(a) $-8\alpha\beta\gamma$

(b) $-4\alpha\beta\gamma$

(c) $-2\alpha\beta\gamma$

(d) $-\alpha\beta\gamma$

9) If α, β and γ are roots of the equation $x^3 - 2x^2 - 7 = 0$, find the equation whose roots are α^2, β^2 and γ^2 .

(a) $x^3 + 4x^2 + 28x + 49 = 0$

(b) $x^3 - 8x^2 - 56x - 98 = 0$

(c) $x^3 - 4x^2 - 28x - 49 = 0$

(d) $x^3 + 4x^2 - 28x + 49 = 0$

10) A polynomial $P(x)$ is even. It has a single root at $x = 1$, a double root at $x = 2$ and passes through the point with co-ordinates $(3, 150)$.

Find the equation of $P(x)$.

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

(b) $\frac{3}{4}(x+1)(x-1)(x+2)^2(x-2)^2$

(c) $\frac{3}{4}(x+1)^2(x-1)^2(x-2)(x+2)$

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

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Answers

- 1) c
- 2) b
- 3) c
- 4) c
- 5) a
- 6) a
- 7) d
- 8) a
- 9) c
- 10) b