Question 1: The general solution of sin x − 3 sin2x + sin3x = cos x − 3 cos2x + cos3x is ________.

Solution:

sinx − 3 sin2x + sin3x = cosx − 3 cos2x + cos3x

⇒ 2 sin2x cosx − 3 sin2x − 2 cos2x cosx + 3 cos2x = 0

⇒ sin2x (2cosx − 3) − cos2x (2 cosx − 3) = 0

⇒ (sin2x − cos2x) (2 cosx − 3) = 0

⇒ sin2x = cos2x

⇒ 2x = 2nπ ± (π / 2 − 2x) i.e.,

x = nπ / 2 + π / 8

Question 2: If sec 4θ − sec 2θ = 2, then the general value of θ is _________.

Solution:

sec 4θ − sec 2θ = 2 ⇒ cos 2θ − cos 4θ = 2 cos 4θ cos 2θ

⇒ −cos 4θ = cos 6θ

⇒ 2 cos 5θ cosθ = 0

⇒ H = [h cot 15°] / [cot 15° − 1] or

nπ/5 + π/10

Question 3: If tan (cot x) = cot (tan x), then sin 2x = __________.

Solution:

tan (cotx) = cot (tanx) ⇒ tan (cotx) = tan (π / 2 − tanx)

cotx = nπ + π / 2 − tanx

⇒ cotx + tanx = nπ + π / 2

2 sin2x = nπ + π / 2

⇒ sin2x = 2 / [nπ + {π / 2}]

= 4 / {(2n + 1) π}

Question 4: If the solution for θ of cospθ + cosqθ = 0, p > 0, q > 0 are in A.P., then numerically the smallest common difference of A.P. is __________.

Solution:

Given cospθ = −cosqθ = cos (π + qθ)

pθ = 2nπ ± (π + qθ), n ∈ I

θ = [(2n + 1)π] / [p − q] or [(2n − 1)π] / [p + q], n ∈ I

Both the solutions form an A.P. θ = [(2n + 1)π] / [p − q] gives us an A.P. with common difference 2π / [p − q] and θ = [(2n − 1)π] / [p + q] gives us an A.P. with common difference = 2π / [p + q].

Certainly, {2π / [p + q]} < {|2π / [p − q]|}