1. Find the equation of the **normal** to the function  when *x* = 4.

 ***y = x ½***

 ***y′ = ½ x - ½  = 1 = 1 at x = 4 so grad of normal = – 4***

 ***2x ½  4***

 ***Equ of normal is y = mx + c m = – 4 through (4, 2)***

 ***2 =***  ***– 4×4 + c so c = 18***

 ***Normal is y = –4x + 18***

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2. Find the equation of the tangent to the curve *y = sin x* at the point

 where *x = π* (leave surds in your answer)

 4

***y ′ = cos x = 1 = √ 2 and y = √ 2***

 ***√2 2 2***

***Tangent is of the form y = mx + c***

***Substituting √ 2 = √ 2 π + c***

 ***2 2 4***

***Tangent is y = √ 2 x + √ 2 – π√ 2***

 ***2 2 8***

3. Find the equation of the tangent to the curve given implicitly as :

 *y2 + 2sin x – e y  = 0* at the point ( *π ,* 0 )

 6

  ***2y y′ + 2cos x – ey y′ = 0***

 ***y′ ( ey – 2y) = 2cos x***

***sub x = 300, y = 0***

 ***y′ ( 1 ) = 2 cos 30 = √3***

 ***grad y′ = √3***

***Equ of tan is y = mx + c***

 ***0 = √3 π + c***

 ***6***

***Equ of tan is y = x√3 – π√3***

 ***6***

4. For the curve with parametric equations :

 *x = t2 – t y = t2 + t*

 find the equation of the normal to the curve at the point where t = 2

***dx = 2t – 1 dy = 2t +1***

***dt dt***

***dy = dy dt = 2t + 1 = 5 grad of normal = – 3***

***dx dt dx 2t – 1 3 5***

***At t = 2 x = 2, y = 6***

***Equ of normal is y = mx + c***

 ***6 = – 3 2 + c c = 36***

 ***5 5***

***Equ of normal is y = – 3 x + 36***

 ***5 5***

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