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| **Solution** | |
| **1**  **[4]** | Sub  and  into equation,    After transformation, the translated curve is .  Substitute , we get  **Alternatively,**  Since  lies on the translated curve, then  should lie on the original curve. Substitute  onto the original curve, we get  From GC,  , i.e. |

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| **Solution** | |
| **2(i)**  **[2]** | Differentiate with respect to *x*: |
| **(ii)**  **[3]** | At ,  and  Gradient of normal =  Hence equation of normal |

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| **Solution** | | | |
| **3(a)**  **[4]** | area of triangle *ABC* =  =  =  =  =  (shown)  Let shortest distance from *B* to *AC* be *h* (which is also the perpendicular distance from *B* to *AC*).    *A*  *C*  *B*  *h*  area of triangle *ABC* =  =  Thus . (shown) | | |
| **(b)**  **[2]** | *Alternative*  Consider a parallelogram *OACB* with  and .  Then the lengths of its diagonals are given by**.**  If , then *OACB* forms a rectangle and thus . | | |
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| **Solution** | |
| **4(i)**  **[2]** |  |
| **(ii)**  **[1]** | (shown) |
| **(iii)**  **[1]** | The sequence  decreases and converges to zero as . |
| **(iv)**  **[2]** | = |
| **(v)**  **[2]** | As ,  , since .  Thus, the series  converges.  Sum to infinity of the series = 1 |

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| **Solution** | |
| **5(i)**  **[4]** |  |
| **(ii)**  **[4]** | Substituting into (1) |

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| **Solution** | | |
| **6(i)**  **[5]** | *x*      *y* | |
| **(ii)**  **[5]** | Intersection between  and | Intersection between  and    From the graph, the intersection occurs at . So, |
|  | From the graphs in **(i)**, the solution is  or . | |

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| **Solution** | |
| **7(a)**  **[4]** | **Or** |
|  | Thus,    When    Hence, maximum  at  . |
| **(b)**  **[6]** | Let *a* and *r* be the first term and common ratio of the geometric progression.  Then,        Substituting (2) into (1),  Hence  or . |

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| **Solution** | |
| **8(i) (a)**  **[4]** | *O*  *x*  *y* |
| **(b)**  **[4]** | *O*  *y*  *x*        3 |
| **(ii)**  **[2]** | By drawing  and , number of solution is 6  *O*  *y*  *x*  3  4      6 |

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| **Solution** | |
| **9(i)**  **[3]** | When ,  Height of Harry’s airplane = 8 m  Distance travelled =  = 12 m |
| **(ii)**  **[2]** | Let the angle of takeoff of Harry’s airplane from the ground be θ. |
| **(iii)**  **[1]** | The paths of Harry’s airplane and Tom’s airplane are parallel to  respectively.  Since , the paths of the airplanes are perpendicular. |
| **(iv)**  **[3]** | Since the airplanes collide,  for some    From the GC, *t* = 7, *s* = 4.  Position vector of the point of collision =  Thus coordinates of the point of collision = .  Tom’s airplane takes off 3 seconds after Harry’s airplane takes off. |
| **(v)**  **[3]** | Vector perpendicular to the plane =  Equation of the plane containing both paths of the airplanes is    Cartesian equation of the plane is . |

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| **Solution** | |
| **10**  **(i)**  **[1]** | Since  , gf does not exist. |
| **(ii)**  **[4]** | ;  So,            For real roots, discriminant,        Therefore or |
| **(iii)**  **[4]** | has asymptotes  and . |
| **(iv)**  **[2]** | When *t* = *a*,  Using GC,  At  , .  Thus, . |
| **(v)**  **[1]** | *y*            *O* |