**2021 ACJC H2 Math Promo Marking Scheme**

|  |  |  |
| --- | --- | --- |
| **Qn** | **Solution** |  |
| **1** | From ,  replace *x* by *x* + *α* :  then  replace *x* by 2*x* :  .   1. Translation of the graph by *α* units in the negative *x*-direction, followed by 2. Scaling parallel to *x* – axis by a factor of ½ . 3. Reflection in the *x* – axis. |  |
| OR | 1. Scaling parallel to *x* – axis by a factor of ½ , followed by 2. Translation of the graph byunits in the negative *x* – axis direction. 3. Reflection in the *x* – axis. |  |
| **2** | Replace *x* by |  |
| **3** | (shown) |  |
|  | Suppose              No solution since  for .  [Or using discriminant:  Since , there’s no real roots.]  There is no stationary point since  for . |  |
| **4 (i)** |  |  |
| **(ii)** |  |  |
| **5(i)** | Using Ratio Theorem |  |
| **(ii)** | Length of projection of  onto |  |
| **(iii)** | Area of triangle *OAC* |  |
| **6**  **(i)** | *L1* is perpendicular to *L2 ,* |  |
| **(ii)** | Equation of line *L3* :  Since *L1* intersects *L3*, sub (1) into (2):    Sub (4) into (5):    Sub (3) into (6): |  |
| **(iii)** | Using results in (i) & (ii), use GC to solve: |  |
| **(iv)** | Using result in (iii),    Angle between *L1*and *L3*: |  |
| **7 (i)** | *y*  -1  (-2,)  *x* = -1  *y* = -1  (, - 2)  *y = x*  (-1,-1)  (-2,-2)  *y =*f(*x*)  *x*  *y =* f -1f(*x*)  *y =*f -1(*x*) |  |
| **(ii)** | Considering the interval ,          (since )    = |  |
| **(iii)** | Since Rf = =Dg  *k*    *k* - 4  2  *x*  *y*  Hence gf exists. |  |
| **8**  **(i) (a)**  **(b)** | At *E*, = 0 . Hence      Hence  When *y* is a maximum,  OR  and *y* = 2*a* |  |
| **(ii)** | =  and  = |  |
| **(iii)** | At *B*,  . |  |
| **(iv)** | Since  Gradient of normal at point *B* is  = .  Equation of normal : |  |
| **9(a)** | Alternative Method: |  |
| **9(b)(i)** | Using partial fractions, |  |
| **(ii)** | As therefore  converges.  . |  |
| **(iii)** |  |  |
| **10(i)** |  |  |
| **(ii)** |  |  |
| **(iii)** |  |  |
| **(iv)** | Let *F* be the foot of perpendicular from *A* to the plane  Equation of line AF :  To find the point of intersection of line AF and plane ,  substitute equation of line into equation of plane, .      **Alternative method**  is a point on the plane .  = Projected vector of on normal of plane.  where is the normal of *ABC* |  |
|  | Let the reflection of A about plane be A’*(x,y,z)*    Alternatively:    Equation of reflected line is: |  |
| **11(i)**  **(a)**  **(b)** | =  =                  Since is acute    when  *V* is a maximum when  Max *V* = =  Maximum volume is cm3 = cm3. |  |
| **(ii) (a)**  **(b)** | Volume of water =    .  When ,  = =  When the depth of the water is *h* cm,  area of water surface = =  = cm2 s-1 = 12.5 cm2s-1 |  |
| **12(i)** |  |  |
| **12(ii)** | Method 1  By GC,  When  When  Method 2 |  |
| **(iii)** | |  |  | | --- | --- | | ***n*** | **End of the month** | | 1 |  | | 2 |  | | 3 |  | |  |  | | *n* |  |   At the end of the *n*th month, the outstanding amount would be |  |
| **(iv)** | Using GC, . |  |
| **(v)** | Total paid:  Interest: |  |