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|  | **YEAR 12 MATHEMATICS SPECIALIST**  **SEMESTER ONE 2017**  **QUESTIONS OF REVIEW 4:**  **Vector Calculus, Equations and Applications** |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Wednesday 31st May Time: 35 minutes Mark /35

Calculator allowed.

1. [7 marks – 2, 1, 2 and 2]

A particle is moving through a 3 dimensional space with velocity given by the vector 

* 1. Determine  given that the particle started at 
  2. Write down an expression for the acceleration vector 
  3. Decide if, and when, the acceleration is perpendicular to the direction of motion
  4. Calculate the distance travelled in the first 5 seconds of motion.

1. [10 marks – 4, 1, 1, 2 and 2]

A child’s model train is moving on a track with position given by 

* 1. Describe its motion in terms of:  
     shape of the track  
     direction of travel  
     period of motion

{Hints: Zoom initialize, set }

* 1. Determine a Cartesian equation to represent the shape of the track.
  2. Specify , the velocity vector
  3. How far does the train travel in 24 seconds?
  4. Calculate the maximum and minimum values of the train’s speed.

1. [9 marks – 3, 3 and 3]
2. Complete the indicated elementary row operations and bring the augmented matrix to echelon form:



1. Use this echelon matrix to solve 
2. For which values of *k* will  have:

##### no solutions

##### a unique solution

1. [9 marks – 3, 2, 1 and 3]
   1. Use elementary row operations to determine the number of solutions to the system of equations represented by the augmented matrix 

Given that ,  and 

* 1. Explain why the system  represents this situation
  2. Write down an equation to represent 
  3. Determine 