PERTH MODERN SCHOOL Exceptional schooling. Exceptional students. Independent Public School	Year 12 Specialist TEST 3 7 May 2018 TIME: 50 minutes working Classpads **allowed!** 39 Marks 7 Questions

Name:_______________________________

Teacher: ____________________________

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (2 & 2 = 4 marks)

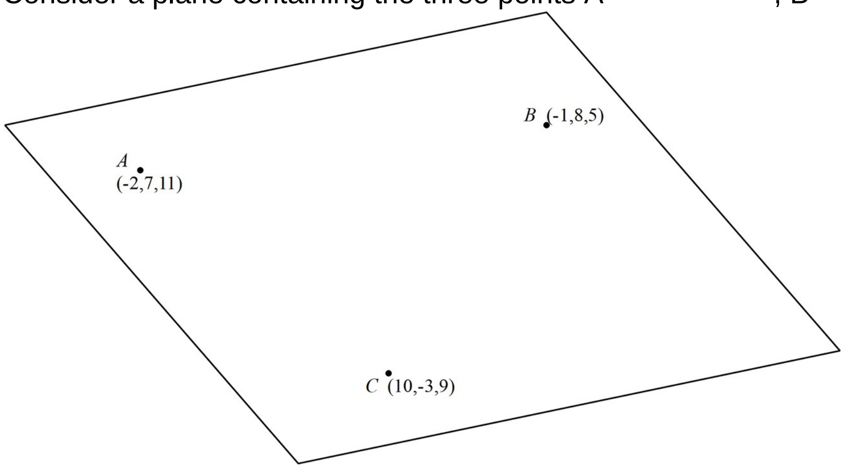
Consider a line with parametric equations $x = 3 - 5\lambda$, $y = -7 + 2\lambda$

i) Determine a vector equation

ii) Determine a cartesian equation.

Q2 (3 & 2 = 5 marks)

Consider a plane containing the three points A $(-2,7,11)$, B $(-1,8,5)$ & C $(10,-3,9)$.



i) Determine the vector equation of the plane.

Continued-

ii) Determine the cartesian equation of the plane(simplified) .

Q3 (4 marks)

Determine the distance of point P $(-5,1,3)$ from the line $\underset{\sim}{r} = \begin{pmatrix} -1 \\ 7 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 5 \\ -8 \\ 1 \end{pmatrix}$

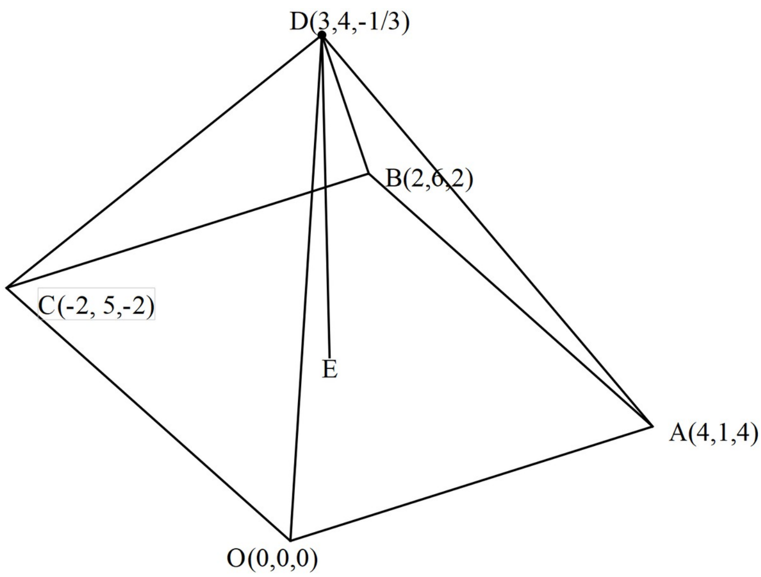
Q4 (4 marks)

Consider two particles A and B whose position at $t = 0$ is recorded as below moving with constant velocities $v_A \ \& \ v_B$. Determine the distance of closest approach and the time that this occurs.

$$r_A = \begin{pmatrix} 2 \\ -5 \\ 9 \end{pmatrix} km \qquad v_A = \begin{pmatrix} 11 \\ -5 \\ 7 \end{pmatrix} km/h$$

$$r_B = \begin{pmatrix} 1 \\ -1 \\ 9 \end{pmatrix} km \qquad v_B = \begin{pmatrix} 12 \\ -10 \\ 2 \end{pmatrix} km/h$$

Q5 (2, 4 & 3 =9 marks)
OABCD is a pyramid. The height of the pyramid is the length of DE, where E is the point on the base OABC such that DE is perpendicular to the base.



i) Show that the base OABC is a rhombus.

The unit vector $p\underset{\sim}{i} + q\underset{\sim}{j} + r\underset{\sim}{k}$ is perpendicular to both OA and OC.

ii) Show that $q = 0$ and determine the exact values of $p \;\&\; r$.

iii) Hence determine the exact height of the pyramid.

Q6 (5 marks)

Consider a sphere of centre $(-3,2,7)$ and radius of a units , where a is a constant.

The line $\underset{\sim}{r} = \begin{pmatrix} 2 \\ 1 \\ -8 \end{pmatrix} + \lambda \begin{pmatrix} 4 \\ 1 \\ -3 \end{pmatrix}$ is a tangent to the above sphere.

Determine the possible value(s) of a

Q7 (2, 3 & 3 = 8 marks)

Consider the function $f(x) = ax^4 + bx^3 + cx^2 + dx$ where $a, b, c \,\&\, d$ are constants.

The graph has a stationary point ($f' = 0$) at $(1,1)$ and passes through the point $(-1,4)$.

i) Write down three linear equations satisfied by $a, b, c \,\&\, d$.

ii) Express $a, b \,\&\, c$ in terms of d **without** the use of a classpad.

iii) Determine the value of d for which the graph has a stationary point where $x = 4$
(You may use a classpad here and show reasoning).