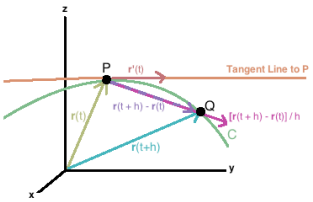
Week 14/15
Term 2
2019

HAWKER COLLEGE
Engage | Inspire | Achieve

Learning Brief
SM3

1. Goals



By the end of this unit, students will:

- understand the concepts and techniques in vectors, complex numbers, functions and graph sketching
- apply reasoning skills and solve problems in vectors, complex numbers, functions and graph sketching
- communicate their arguments and strategies when solving problems
- construct proofs of results
- interpret mathematical information and ascertain the reasonableness of their solutions to problems.

This week:

- differentiate and integrate a vector function with respect to time
- determine equations of motion of a particle travelling in a straight line with both constant and variable acceleration

2. Theoretical Components

Refer to PDF on G/Drive for notes and examples on Vector Calculus.

The following videos will help explain key points (via examples) and will make it easy to understand:

Derivative of a vector valued function:
https://goo.gl/cjiPJ8

https://goo.gl/qtxyyP

Position, Velocity & Acceleration:
https://goo.gl/Qzf2yE

https://goo.gl/iFKjMh

https://goo.gl/OdmSV4

Extension: Dare!!!

Vector Calculus in a nutshell: https://bit.ly/2WKI9iH

Calculus of Motion: https://bit.ly/2YBHMrv

3. Practical Components

Attempt the questions in the PDF (G/Drive/WK14 folder)

Prepare well for the Open Book In-Class Exercise (scheduled for WK16 Friday, L4)

4. Investigation

A: **Describe** the parametric curve represented by the equations $x = a\cos t \quad y = a\sin t \quad z = ct$

5 marks

B: Graphs of vector valued functions can range from continuous and smooth to discontinuous and wildly erratic. A curve $r(t)$ is smoothly parametrized by $r(t)$, or that $r(t)$ is a smooth function of t if $r'(t)$ is continuous and $r'(t) \neq 0$ for any allowable value of t. Geometrically, this means that a smoothly parametrized curve can have no abrupt changes in direction as the parameter increases. Determine whether the following vector valued functions are smooth.

a) $r(t) = a\cos t\,\boldsymbol{i} + a\sin t\,\boldsymbol{j} + ct\,\boldsymbol{k}; \quad a\ \&\ c > 0$

b) $r(t) = t^2\boldsymbol{i} + t^3\boldsymbol{j}$

6 marks

5.QFO

Quiz/Forum/Other

Race cars with constant speed around curve: https://goo.gl/60dZdT