**Kingsway Christian College**

**Maths Department**

**Course**: Math Methods unit 3

**Assessment Task**: Test 2

**Student Name**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Date**: 23rd & 24th March 2017

**Assessment Score**: \_\_\_\_\_\_\_\_\_\_\_\_ / 50

**Year Score**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Comments**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Teacher signature**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Parent/ Guardian signature**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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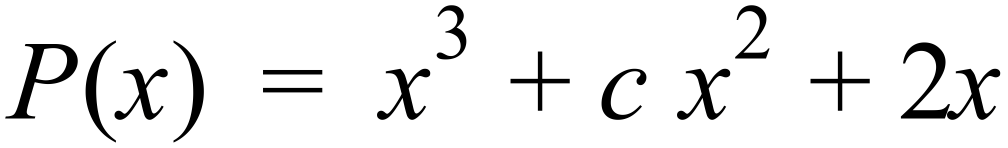
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**Math Methods Unit 3 Test 2 2017  
Differentiation**

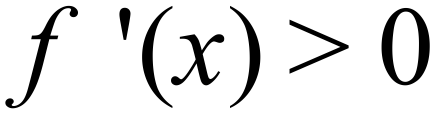
**Resource Free Time: 30 minutes Marks: / 27**

**Only a formula sheet is allowed for this section. No calculator or notes allowed.**

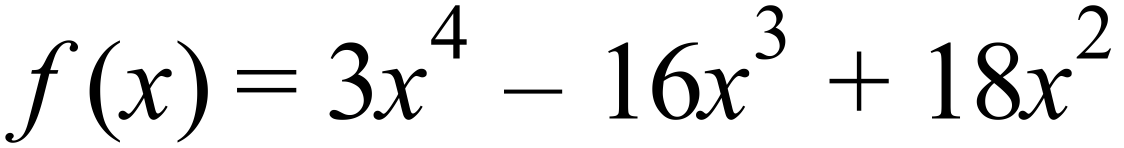
**Question 1 (6 marks)**

**(a)** For what values of *c* does the polynomial  have an inflection point where *x* = 3? (3 marks)

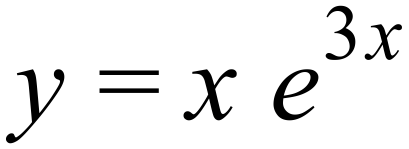
**(b)** Sketch the graph of a function that such that: (3 marks)

*  for all
* vertical asymptote at *x* = 1
* if
* if
* and

**Question 2 (6 marks)**

Determine the maximum and minimum value for *f* (*x*) and the value of *x* at which they occur, for the function  over the domain  .

**Question 3 (7 marks)**

Determine the coordinates of all intercepts, stationary points and points of inflection of the function .

Justify the nature of the stationary points found using a standard test.

**Question 4 (3 marks)**

Determine the equation of the normal to the curve at (2,2).

**Question 5 (5 marks)**

Find the equation of the tangent to the curve at the point ( ;

**Math Methods Unit 3 Test 2 2017 Differentiation**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Resource Assumed Time: 25 minutes Marks: / 23**

**CAS calculator and a formula sheet are allowed for this section**

**Question 6 (5 marks)**

A cylindrical can is to be made to hold 1 000 cm3 of oil. Find the dimensions that will minimise the amount of the metal to make the can. Assume the can is made with a lid.

**Question 7 (9 marks)**

The cost in dollars of producing items is given by:

The revenue per item sold is given by $.

1. State the revenue function for number of items sold. (1 mark)
2. Give an expression for the profit function . (1 mark)
3. Determine how many items are needed to make a maximum profit and state the

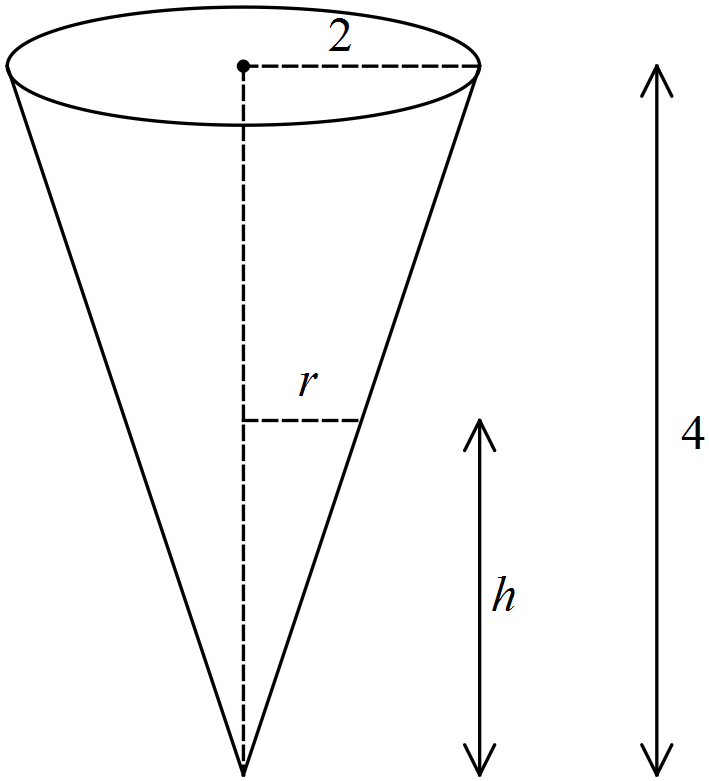
maximum profit. (3 marks)

1. Explain clearly if a loss occurred and when it occurred. (2 marks)
2. Determine the marginal profit of the 250th item sold. (2 marks)

**Question 8 (4 marks)**

Use derivatives to find the approximate change in the radius of a spherical balloon corresponding to a change in its volume from 200 cm3 to 195 cm3. Answer to 4 decimal places.

**Question 9 (5 marks)**

A water tank has the shape of an inverted circular cone with base radius 2 m and height 4 m.

1. Proof that the volume of the tank is given by the following formula:

(1 mark)

1. If water is being pumped into the tank at a rate of 2 m3/min, find the rate at which the

water level is rising when the water is 3 m deep.

Answer to the nearest cm/min. (4 marks)