

**Mathematics Specialist**

**Test 4 2016**

**Integration Techniques &**

**Applications of Integral Calculus**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ TEACHER: MLA**

**Resource Free Section**

**30 marks**

**30 minutes**

**Question 1 [3, 3 & 3 = 9 marks]**

Determine the following indefinite integrals:

(a)

(b)

(c)

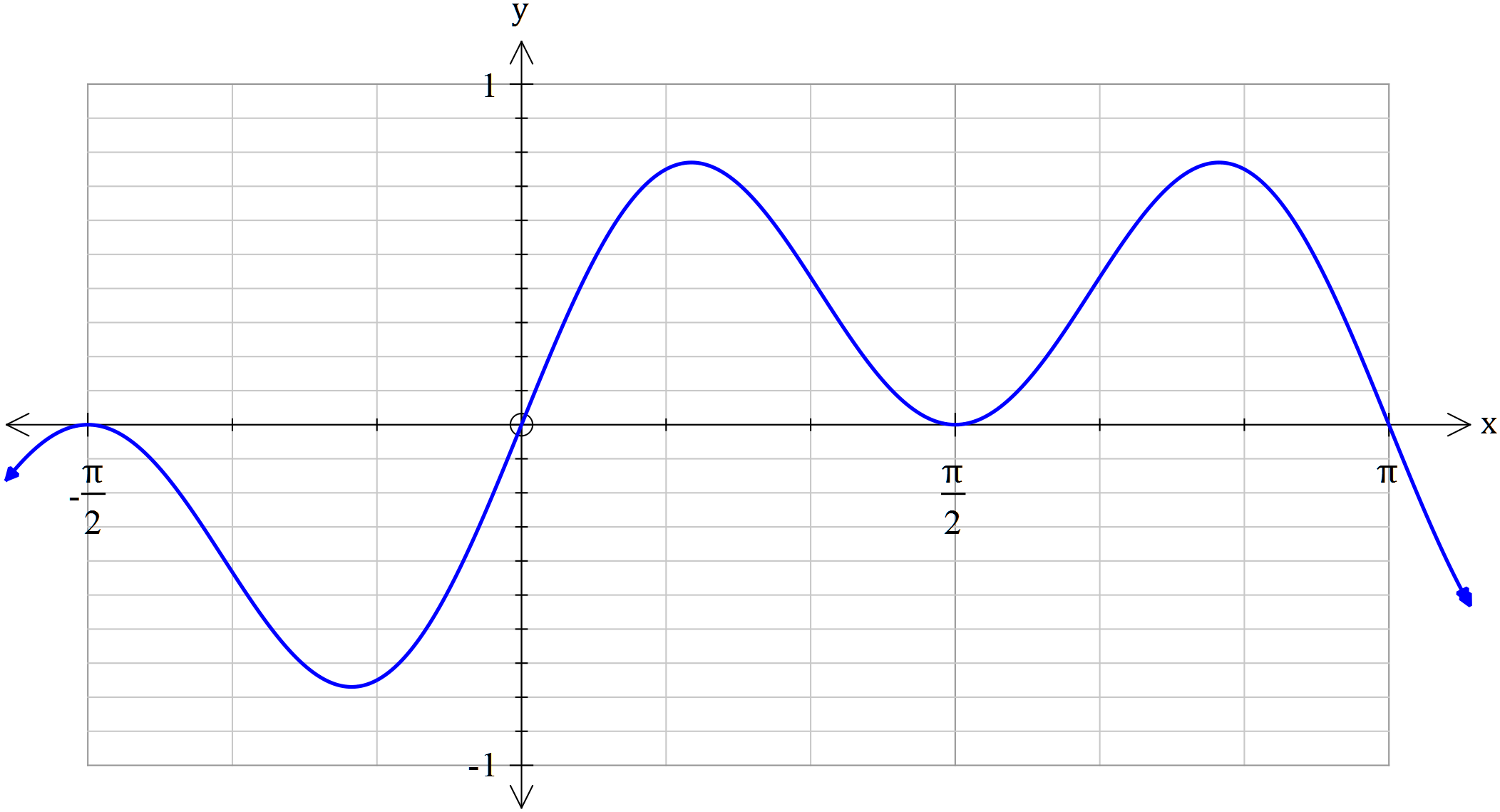
**Question 2 [5 marks]**

Use the substitution to evaluate

**Question 3 [3 & 3 = 6 marks]**

1. , determine f(x).
2. Hence, calculate the area between the curve and the x-axis from

.



**Question 4 [5 marks]**

Calculate the exact volume generated by revolving the area trapped the vertical axis and the lines and



**Question 5 [2 & 3 = 5 marks]**

(a) If, determine

Hint 1: Apply a suitable log law to before differentiating

Hint 2: Do not factorise your final answer

(b) Hence, find



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**Resource Rich Section**

**20 marks**

**20 minutes**

**One unfolded A4 page of notes, SCSA formulae booklet and ClassPad calculator permitted**

**Question 6 [1 & 1 = 2 marks]**

(a) Express in exact terms

(b) Evaluate

**Question 7 [6 marks]**

Use your knowledge of partial fractions to determine

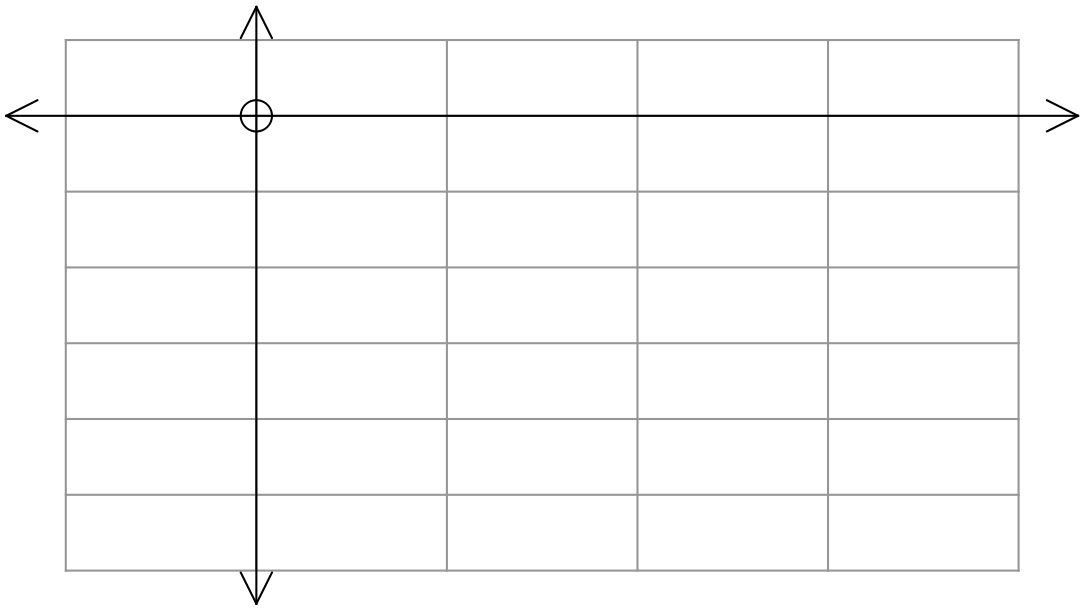
Show clear working.

**Question 8 [3, 2, 2 & 1 = 8 marks]**

Consider the functions

A, B and (0, 0) are the three points of intersection of the aforementioned functions.

(a) Draw a neat sketch of f(x) and g(x) on the axes below. Label points A and B.



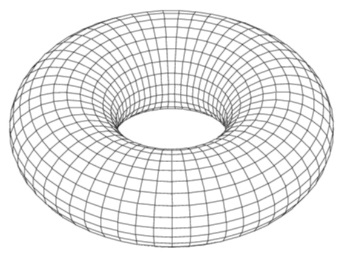
(b) State the ordered pairs for points A and B, correct to 2 decimal places.

(c) State the definite integral that defines the area enclosed by f(x) and g(x) between points A and B.

(d) Use your Classpad to determine the area described in (c).

**Question 9 [4 marks]**

In geometry, a torus is a surface of revolution generated by revolving a circle in 3-dimensional space about an axis co-planar with the circle.

[](https://www.google.com.au/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRxqFQoTCInilOmS58cCFaLlpgodub8Pzw&url=https://mycqstate.wordpress.com/2013/10/01/quantum-pcp-a-survey/&psig=AFQjCNF_oETq3iNUHp1-M_bF0Wsz9cna1Q&ust=1441791632769267)

Use calculus to determine the volume of the torus formed by rotating the circle with equation about the x-axis.