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# University of Swaziland



**Final Examination – May 2015**

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## **BA in Social Science I**

**Title of Paper** : Elementary Quantitative Techniques II  
**Course Number** : MS012  
**Time Allowed** : Two (2) hours

### **Instructions:**

1. This paper consists of 2 sections.
2. Answer ALL questions in Section A.
3. Answer ANY 2 questions in Section B.
4. Show all your working.

**THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.**

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**Section A**  
**Answer ALL Questions in this section**

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**A.1 a. Evaluate**

i.  $\lim_{x \rightarrow -3} (x^2 - 7x - 9)$  [2 marks]

ii.  $\lim_{x \rightarrow 3} \left( \frac{4x + 6}{x^2 + 3} \right)$  [2 marks]

iii.  $\lim_{x \rightarrow 3} \left( \frac{x - 3}{3x - x^2} \right)$  [3 marks]

iv.  $\lim_{x \rightarrow \infty} \left( \frac{6x^2 - 7x + 3}{4 - 3x - 2x^2} \right)$  [4 marks]

**A.2 a. State the *limit definition* of the derivative of the function  $f(x)$ .** [2 marks]

b. Use the limit definition to find  $\frac{df}{dx}$  given

$$f(x) = 3x - 5. \quad [7 \text{ marks}]$$

c. Find  $y'$  if

i.  $y = 7 + 5x - 3x^2$  [2 marks]

ii.  $y = 12X^{\frac{3}{4}} - 25X^{-\frac{2}{5}}$  [3 marks]

iii.  $y = x - \frac{3}{x}$  [3 marks]

iv.  $y = e^{2x-3}$  [2 marks]

v.  $y = \ln(4x)$  [3 marks]

**A.3 a. State the *Fundamental Theorem of Calculus*.** [3 marks]

b. Integrate

i.  $\int_0^5 (9 + 8x - 6x^2) dx$  [5 marks]

ii.  $\int \left( 6X^{\frac{1}{2}} - \frac{5}{X} \right) dX$  [3 marks]

iii.  $\int \left( \frac{4}{x^3} - \frac{6}{x^4} \right) dx$  [3 marks]

iv.  $\int e^{-2x} dx$  [3 marks]

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## Section B

Answer ANY 2 Questions in this section

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**B.4** a. Find the value of the limit

$$\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1} \quad [7 \text{ marks}]$$

b. Find the indicated derivative

i.  $y = (x^2 + 4)^8$   $y'$  [3 marks]

ii.  $y = xe^{-2x}$ ,  $y'$  [4 marks]

iii.  $y = \frac{2x}{4 - 5x}$ ,  $y'$  [6 marks]

iv.  $y = 8\sqrt{x} - \frac{1}{x}$ ,  $y'''$  [5 marks]

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**B.5** a. Consider the function

$$y = 4 + 9x^2 - x^3.$$

i. Find the *stationary points* and classify them as relative maxima or minima. [10 marks]

ii. Find the  $y$ -intercept. [2 marks]

iii. Make a sketch of the graph of  $y$ . [4 marks]

b. The profit (in Emalangeni) of a company is given by

$$P(x) = 85x - 0.02x^2 - 10000$$

where  $x$  is the number of units sold per month. Find the

i. profit if the number of units sold is 1,500 [3 marks]

ii. the maximum monthly profit. [6 marks]

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## Section B

Answer ANY 2 Questions in this section

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**B.6** a. By first making the substitution  $u = x^2 - 1$ , evaluate the integral

$$\int 10x(x^2 - 1)^4 dx. \quad [10 \text{ marks}]$$

b. The total costs of a company (under certain conditions) are given by

$$C(x) = x^2 + \frac{2000}{x}$$

where  $x$  is the number of units (in thousands) produced per month. Find the number of units that minimises the monthly total costs. [15 marks]

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**B.7** a. Use the method of tabular integration to evaluate

$$\int 81xe^{2x} dx. \quad [12 \text{ marks}]$$

b. Find the area of the shaded region in the figure below. [13 marks]

