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# University of Swaziland



## Final Examination May 2013

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### BA in Social Sciences I

**Title of Paper** : Elementary Quantitative Techniques II

**Course Number** : MS012

**Time Allowed** : Three (3) hours

**Instructions** :

1. This paper consists of SEVEN questions printed on FIVE pages.
2. Each question is worth 20%.
3. Answer ANY FIVE questions.
4. Show all your working.

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

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### Question 1

Evaluate

a.  $\lim_{x \rightarrow 4} (x^2 + 7x - 1)$  [2 marks]

b.  $\lim_{x \rightarrow 3} \frac{4x + 8}{x^2 - 2x - 1}$  [3 marks]

c.  $\lim_{x \rightarrow -2} \frac{x^2 + x - 2}{x^2 - 4}$  [5 marks]

d.  $\lim_{x \rightarrow \infty} \frac{2x^2 - 4x + 5}{x^2 + 3x - 7}$  [5 marks]

e.  $\lim_{x \rightarrow \infty} \frac{4x - 7}{3x^2 - x + 9}$  [5 marks]

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### Question 2

(a) Find  $f'(x)$  using the *limit definition* for

$$f(x) = 3x^2 + 7. \quad [12 \text{ marks}]$$

(b) Differentiate

i.  $f(x) = x^8 - 3x^4 + 9$  [2 marks]

ii.  $H(X) = 8X^{\frac{3}{4}} - 9X^{-\frac{2}{3}}$  [3 marks]

iii.  $G(t) = \frac{2}{t^2} - \frac{4}{t^4}$  [3 marks]

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**Question 3**

(a) Differentiate

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

ii.  $y = \ln 7x$  [2 marks]

iii.  $y = \ln(x^7)$  [2 marks]

iv.  $y = \ln(4x^2 - 7)$  [2 marks]

v.  $y = \sin(3x - 2)$  [2 marks]

vi.  $y = (5x^2 + 7)^{14}$  [3 marks]

(b) Use the quotient rule to differentiate

$$G(x) = \frac{x}{5x + 2}. \quad [7 \text{ marks}]$$

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**Question 4**

(a) Find the indicated derivative

i.  $y = 5x^2 - \frac{3}{x^2}, \quad y''' \quad [5 \text{ marks}]$

ii.  $y = \cos 3x, \quad y^{iv} \quad [5 \text{ marks}]$

(b) Integrate

i.  $\int (4x^3 - 2x + 5) dx \quad [2 \text{ marks}]$

ii.  $\int (10X^{\frac{2}{3}} - 9X^{-\frac{5}{2}}) dX \quad [4 \text{ marks}]$

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

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### Question 5

(a) Integrate

i.  $\int 6e^{2x} dx$  [2 marks]

ii.  $\int 12 \sin 3x dx$  [2 marks]

iii.  $\int 12 \cos 4x dx$  [2 marks]

(b) Use tabular integration to evaluate

$$\int 48x^2 e^{2x} dx. \quad [6 \text{ marks}]$$

(c) Find the values of  $A$  and  $B$  such that

$$\frac{x+4}{x(x+2)} = \frac{A}{x} + \frac{B}{x+2}. \quad [5 \text{ marks}]$$

Hence evaluate

$$\int \frac{x+4}{x(x+2)} dx. \quad [3 \text{ marks}]$$

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### Question 6

(a) For each function, find the *stationary points and classify them* as relative maximum or minimum. Also find the *y-intercept* and hence *sketch* the graph of the given function.

i.  $y = 3 + 20x - 2x^2$  [6 marks]

ii.  $y = x^3 + 9x^2 - 5$  [9 marks]

(b) The profit  $P$  of a company is given by

$$P(x) = 50x - 0.1x^2 - 150,$$

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

i. The number of units that give maximum profit [3 marks]

ii. The maximum profit possible per month. [2 marks]

### Question 7

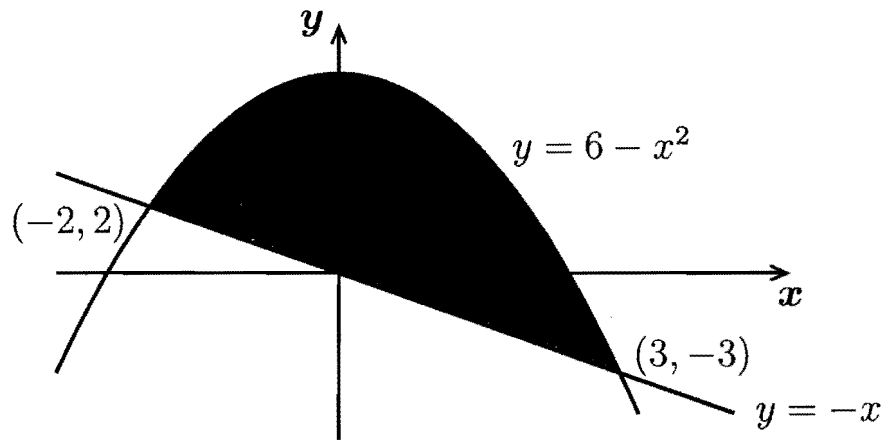
(a) Evaluate

i.  $\int_0^2 (6x^2 + 8x - 3) dx$  [3 marks]

ii.  $\int_{-1}^1 \left( \frac{10}{x^3} - \frac{8}{x^5} \right) dx$  [3 marks]

iii.  $\int_1^4 (9X^{\frac{1}{2}} - X^{-\frac{1}{2}}) dX$  [4 marks]

(b) The diagram below (not drawn to scale) shows the region enclosed between the parabola  $y = 6 - x^2$  and the straight line  $y = -x$ .



Find the area of the region.

[10 marks]

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