



First Year (100 Level) Examination in Bachelor of Arts (External New Syllabus) (April 2017)

FNDE 102: Basic Mathematics

Instructions: Answer any **FIVE** questions only. Marks allocated for each question indicated accordingly.  
 The total number of questions in this paper is 08.

Time : **Three** Hours

1. a. Solve the followings.

i.  $(4 - x) \div \frac{x^2 - 16}{5}$

ii.  $\sqrt[4]{3^{12}}$

iii.  $\left(\frac{4x^{1/3}}{x^{1/2}}\right)^{1/2}$

iv.  $\sqrt{12x^5y^2}$

v.  $\left(-6 + \frac{9}{2}\right)^{-1}$

(10 marks)

b. Factorize the following polynomial expressions completely.

i.  $100p^2 - 40p + 4$

ii.  $y^3 - 1$

iii.  $x^2 + 8x + 16$

iv.  $8t^3 + 125p^3$

v.  $81v^4 - 900v^2$

(10 marks)

2. a. Solve and graph following inequalities

i.  $2(2x + 3) - 10 < 6(x - 2)$

ii.  $-9 < 5 - 7y \leq 12$

iii.  $\frac{2x - 3}{4} + 6 \geq 2 + \frac{4x}{3}$

(12 marks)

b. Solve following simultaneous inequalities using graph

i.  $x + y \leq 1$

ii.  $x = y$

$y - x \leq 1$

$x > y$

$y - 2x \geq 1$

$x < y$

(8 marks)

3. a. Consider the following quadratic functions

A.  $f(x) = x^2 + 4x$

B.  $g(x) = -2x^2 + 4x - 5$

i. Find the minimum or maximum value of each quadratic function

(8 marks)

ii. Sketch the graphs of  $f$  and  $g$

(8 marks)

b. Find the second derivative of following functions

i.  $f(x) = 6x^2 + 3x - 1$

ii.  $f(x) = -5x^3 - x^2 + 10x + 5$

(4 marks)

4. a. Amara and Bala shopped the fruits at the same store. Amara bought 5 kg of apples and 2 kg of bananas and paid altogether Rs.22. Bala bought 4 kg of apples and 6 kg of bananas and paid altogether Rs 33.

i. Solve the system using algebraic techniques to find the cost of 1 kg of bananas and apples

(4 marks)

ii. Solve the system by graphical methods.

(4 marks)

b. Solve the following simultaneous equations

$$2x + y + z - 3 = 0$$

$$x - y - z = 0$$

$$x + 2y + z = 0$$

(12 marks)

5. Evaluate the following limits.

i.  $\lim_{p \rightarrow \frac{2}{3}} 3p(2p - 1)$

iv.  $\lim_{x \rightarrow \infty} \frac{x^3 + 1}{x + 1}$

ii.  $\lim_{t \rightarrow -1} \frac{t^2 + 3t + 2}{t^2 - t - 2}$

v.  $\lim_{h \rightarrow 0} \frac{\sqrt{5h+4} - 2}{h}$

iii.  $\lim_{y \rightarrow 0} \frac{\sqrt{6 - \sqrt{5y^2 + 11y + 6}}}{y}$

(20 marks)

6. Differentiate the following functions.

i.  $f(x) = \ln(1 - x)$

ii.  $y = x^{0.1} + \frac{1}{\sqrt{x}} + (\sqrt[4]{x})^3$

iii.  $y = 19x^4 + 45x^2 - 23x + 1$

iv.  $y = e^{4x^2}$

v.  $y = (x^2 - 5x)(x + 4)$

(20 marks)

7. Integrate the following functions.

i.  $\int (2x^4 + 3x^5) dx$

ii.  $\int \frac{1}{7-5x} dx$

iii.  $\int e^{9x} dx$

iv.  $\int_1^4 2x^{-1} dx$

v.  $\int_0^{\frac{1}{2}} 8(1-4x)^3 dx$

(20 marks)

8. The number of sports turning up when a six-sided die is tossed is observed. Consider the following events:

A: The number observed is 3, 4 or 5

B: The number observed is greater than 3

C: The number observed is less than 3

D: The number observed is 3

i. Define a sample space for this random experiment, and assign probabilities to outcomes

ii. Find  $P(A)$ ,  $P(B)$ ,  $P(C)$  and  $P(D)$

iii. Find  $P(\overline{A})$

iv. Find  $P(A \cap B)$

v. Find  $P(A \cup B)$

vi. Are events B and C mutually exclusive?

(20 marks)