Kabarak University

BMATH 002 – Basic Algebra

INST: Answer Question One and Any other Three Questions

Q1. (25 MARKS)

(a) Use the properties of exponential to Simplify the following expressions

(*i*) $x^2 \cdot x^{-6} \cdot x^4$

(*ii*) $\frac{4^6}{4^2} \times 4^3$

(*iii*) $\left(2^2 \cdot x^0\right)^4$ (10 marks)

(*iv*) $\left[\left[\left(x^2 y^{-3}\right)\left(xy^3\right)\right]^2\right]^0$

(*v*) $\left(\frac{6^4}{4^{-2}}\right) \cdot \left(\frac{4^6}{6^{-3}}\right)$

(b) Solve for x in the following expressions

i. $3^{2x} = 3^{4+x}$

ii. $2^{x+1} = 2^{4x-5}$ (6 marks)

iii. $4^{x+1} = 64$

(c) Given log 2 = 0.3010 and log 3 = 0.4771. Evaluate the following logarithms in base 10 without using a calculator;

i) log 16 *ii) log 15* *iii) log 45*

iv) log 400 *v)* $\frac{\log 6}{\log 3}$ (5 marks)

Using the basic properties of logarithms, solve the following equation for x

vii. $\log_3 x + \log_3 (5 + 2x) = 3$

(4 marks)

viii. $\log_4 x - \log_4 (x - 1) = 1$

Q2. (15 marks)

(b) solve for x in the following equations;

$(i)\quad 5x-2+x=8-3x+10$

$(ii)\quad \sqrt{\left(\frac{4x\ -1}{2x+1}\right)}=2$

(10 marks)

$(iii)\quad x^2-3x-10=0$

$(iv)\quad |3x-4|-3=9$

$(v)\quad |5-2x|\leq 3$

Q3. (15 marks)

(a) The sum of two numbers is 20. If 4 is added to the larger number, the result is 3 times the smaller number. Find the numbers. (4 marks)

(b) The area of the rectangle shown below is 24 cm^2. What is the value of x? (4 marks)

.x cm

(x+2) cm

(c) Using binomial expansion,

i) write the 5^{th} and the 12^{th} terms in the following expression;
$(x + 2)^{18}$ (3 marks)

ii) using the 1^{st} four terms in the binomial expansion, approximate to nearest 6 decimal points the value $(2.02)^{10}$ (4 marks)

Q4. (15 marks)

(a) Evaluate the function for $f(x) = 3x^2 - 2x + 1$ and $g(x) = x - 1$.

i) *(f+g)(3)*
ii) *(fg)(4)*
iii) *(f/g)(x)*
iv) *(f/g)(4)* (8 marks)

(b) Given: $f(x) = 3x + 5$ and $g(x) = 5 - x$

Find; (i) $f - g(x)$, (ii) $f - f(x)$ and (iii) $f^{-1}(x)$; given (7 marks)

Q5. (15 marks)

(a) Perform the indicated operations if possible.

i. $\begin{bmatrix} -1 & 4 \\ 2 & -6 \end{bmatrix} - \begin{bmatrix} 1 & -2 \\ 0 & 5 \end{bmatrix}$ ii. $\begin{bmatrix} 4 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 0 & 4 \end{bmatrix} + \begin{bmatrix} -2 & 1 & 3 \\ 5 & 6 & -8 \\ 3 & 0 & 7 \end{bmatrix}$

iii. $\begin{bmatrix} -1 & 4 \\ 2 & -6 \end{bmatrix} \times \begin{bmatrix} 1 & -2 \\ 0 & 5 \end{bmatrix}$ iv. $\begin{bmatrix} -3 & 5 \\ 2 & 0 \\ 1 & 4 \end{bmatrix} \times \begin{bmatrix} -2 & 1 & 3 \\ 5 & 6 & -8 \end{bmatrix}$

(8 marks)

(b) Find the determinants of the following matrices if they exist;

i. $\begin{bmatrix} 11 & 4 \\ -3 & 0 \end{bmatrix}$ *ii.* $\begin{bmatrix} 0 & 2 & 1 \\ 3 & -1 & 2 \\ 4 & 0 & 1 \end{bmatrix}$ *ii.i* $\begin{bmatrix} 0 & 4 \\ 3 & 2 \\ -2 & 1 \end{bmatrix}$ (7 marks)

Q6. (15 marks)

(a) using the matrix method, solve the following system of linear equations;

$2x - 3y = -10$
$3x + 2y = 11$ (6 marks)

(b) Using the determinant method, find the following:

i. The equation of a line that passes thro' the points ; (-1,3) and (3,6). (3 marks)

ii. Area of a triangle whose vertices have the following co-ordinates (-1,0) (3,8) and (6,-1). (3 marks)

iii. Check whether these points are collinear; (0,2), (3,4) and (6,1). (3 marks)