

# 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)  $(2^2 \cdot x^0)^4$  (10 marks)

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

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

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

(10 marks)

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

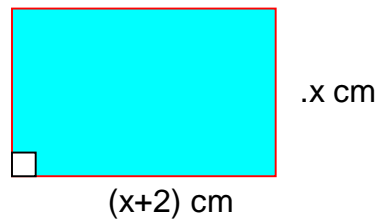
(iv)  $|3x - 4| - 3 = 9$

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

**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  $24 \text{ cm}^2$ . What is the value of x? (4 marks)



(c) Using binomial expansion,

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

ii) using the 1<sup>st</sup> 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.  $\begin{bmatrix} 0 & 2 & 1 \\ 3 & -1 & 2 \\ 4 & 0 & 1 \end{bmatrix}$       iii.  $\begin{bmatrix} 0 & 4 \\ 3 & 2 \\ -2 & 1 \end{bmatrix}$       (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 coordinates  $(-1,0)$   $(3,8)$  and  $(6,-1)$ . (3 marks)
- iii. Check whether these points are collinear;  $(0,2)$ ,  $(3,4)$  and  $(6,1)$ . (3 marks)