

King Fahd University of Petroleum and Minerals
College of Sciences
Prep-Year Math Program

KEY

Math 001 Exam I
Term 022 (2002-2003)
Saturday, March 22, 2003
Time Allowed: 90 Minutes

KEY

Student's Name:

ID #:

This exam consist of three parts:

- Part I : Multiple Choice** : Bubble the correct answer on the OMR sheet
- Part II : TRUE / FALSE** : Bubble the correct answer on the OMR sheet
- Part III : Written** : Provide neat and complete solutions. Show all necessary steps for full credit.

Calculators, pagers, or mobiles are NOT allowed during this examination.

Question	Points	Student's Score	Grader
Part I: Multiple Choice	6		
Part II: TRUE / FALSE	6		
Part II: Written 1	3		Mr. Al-Labadi
2	4		Mr. Al-Labadi
3	3		Mr. Saleh
4	3		Mr. Saleh
5	3		Mr. Sharqawi
6	3		Mr. Alzoubi
7	3		Mr. Alzoubi
8	4		Dr. Tawfiq
9	6		Mr. Awad
Total	44		

Part I: (6 points) Multiple Choice Questions (MCQ)**Bubble the correct answer on the OMR sheet.**

1. The irrational numbers in the set $\left\{3.14, \frac{22}{7}, \frac{\pi}{2}, 1.\bar{3}, \sqrt{3}, \sqrt{16}\right\}$ are:

- (a) $\frac{\pi}{2}$ and $\sqrt{3}$
- (b) $\sqrt{3}$ and 3.14
- (c) $\frac{\pi}{2}$, $\sqrt{3}$, and $\sqrt{16}$
- (d) 3.14, $\frac{\pi}{2}$, $1.\bar{3}$, and $\sqrt{3}$

2. The property of real numbers illustrated in the statement $3(x + y) = 3(y + x)$ is:

- (a) the commutative property of addition.
- (b) the associative property of multiplication.
- (c) the commutative property of multiplication.
- (d) the distributive property.

3. The expression $|-2 - \pi| - \sqrt{(-3)^2} + |6 - 2\pi| + \sqrt[3]{(-3)^3}$ is equal to:

- (a) $3\pi - 10$
- (b) $3\pi - 4$
- (c) $3\pi - 14$
- (d) $8 - \pi$

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4. The expression $\frac{5}{\sqrt[3]{8x^2}}$ simplifies to:

(a) $\frac{5\sqrt[3]{x}}{2x}$

(b) $\frac{5\sqrt[3]{x^2}}{4x}$

(c) $\frac{5\sqrt[3]{x^2}}{8x}$

(d) $\frac{10\sqrt[3]{x}}{x}$

5. The scientific notation of the number 0.000002015 is:

(a) 2.015×10^{-6}

(b) 20.15×10^{-7}

(c) 2.015×10^{-5}

(d) 2.015×10^6

6. The expression $3x^2 + 5[4x^2 - 6(3x + 1)]$ simplifies to:

(a) $23x^2 - 90x - 30$

(b) $23x^2 - 18x + 1$

(c) $23x^2 - 90x + 30$

(d) $23x^2 - 90x + 5$

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Part II: (6-points) TRUE OR FALSE Statements**Bubble the correct answer on the OMR sheet****A for TRUE****B for FALSE**

7. The set of prime numbers is closed under addition.

- (A) TRUE
(B) FALSE

8. If the distance between a real number x and -10 is not more than 8, then $|x+10| \leq 8$.

- (A) TRUE
(B) FALSE

9. The polynomial $4x^2y^3 - 5x^3y^2 + 6x^4y^3$ is of degree 4.

- (A) TRUE
(B) FALSE

10. The expression $\frac{1}{a^{-1} + b^{-1}}$ is equal to $a + b$.

- (A) TRUE
(B) FALSE

11. The coefficient of x^2 in the expression $(3x - 5)^3$ is equal to -135 .

- (A) TRUE
(B) FALSE

12. The inequality $x < -5$ AND $x \geq 5$ in interval notation is equal to $(-\infty, -5) \cup [5, \infty)$.

- (A) TRUE
(B) FALSE

Part III: Written Questions

**Provide neat and complete solution to each question.
Show necessary steps for full credit.**

1. (3-points) Given the sets $A = \{x \mid x \text{ is a composite number } < 11\}$, and $B = \{z \mid z = 2y + 1, \text{ where } y \text{ is an integer with } -1 \leq y < 5\}$.

(i): List all elements of A .

$$A = \{4, 6, 8, 9, 10\} \quad \dots \quad 1 \text{ point}$$

(ii): List all elements of B .

$$B = \{-1, 1, 3, 5, 7, 9\} \quad \dots \quad 1 \text{ point}$$

(iii): List all elements of $A \cap B$.

$$A \cap B = \{9\} \quad \dots \quad 1 \text{ point}$$

2. (4-points) Simplify the expression $\left[\frac{(-2)^0 9^{-2} x^{-2} y^{-2/3}}{(81)^{-2} x^{-4} y^{10/3}} \right]^{1/2}$

where x and y are nonzero real numbers.

$$\begin{aligned} \text{The expression} &= \left[\frac{(1) 3^{-4} x^{-2+4}}{3^{-8} y^{10/3 + 2/3}} \right]^{1/2} \quad \dots \quad 2 \text{ points} \\ &= \left[\frac{3^4 x^2}{y^4} \right]^{1/2} \quad \dots \quad 1 \text{ point} \\ &= \frac{9|x|}{y^2} \quad \dots \quad 1 \text{ point} \end{aligned}$$

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3. (3-points) Factor by grouping: $18x^2 - 24xy + 8y^2 - 6x + 4y$.

$$\begin{aligned} \text{The expression} &= 2(9x^2 - 12xy + 4y^2 - 3x + 2y) \\ &= 2[(3x - 2y)^2 - (3x - 2y)] \quad \dots \quad 2 \text{ points} \\ &= 2(3x - 2y)(3x - 2y - 1) \quad \dots \quad 1 \text{ point} \end{aligned}$$

4. (3-points) Completely factor: $x^6 - 63x^3 - 64$.

$$\begin{aligned} \text{The expression} &= (x^3 - 64)(x^3 + 1) \quad \dots \quad 1 \text{ point} \\ &= (x - 4)(x^2 + 4x + 16)(x + 1)(x^2 - x + 1) \\ &\quad \dots \quad 2 \text{ points} \end{aligned}$$

5. (3-points) Simplify: $-3x^2\sqrt{54x^4} + 2\sqrt{16x^7}$.

$$\begin{aligned} \text{The expression} &= -3x^2\sqrt{(2)(3)^3 x^3 x} + 2\sqrt{(2)(2)^3 x^6 x} \\ &\quad \dots \quad 1 \text{ point} \\ &= -9x^2\sqrt{2x} + 4x^2\sqrt{2x} \quad \dots \quad 1 \text{ point} \\ &= -5x^2\sqrt{2x} \quad \dots \quad 1 \text{ point} \end{aligned}$$

6. (3-points) Perform the indicated operation and write your answer in the simplest form.

$$\begin{aligned} &(2\sqrt[3]{3} - \sqrt[3]{2})(4\sqrt[3]{9} + 2\sqrt[3]{6} + \sqrt[3]{4}) \\ &= 8\sqrt[3]{27} + 4\sqrt[3]{18} + 2\sqrt[3]{12} - 4\sqrt[3]{18} - 2\sqrt[3]{12} - \sqrt[3]{8} \\ &= (8)(3) - 2 = 22 \quad \dots \quad 1 \text{ point} \end{aligned}$$

OR The expression = $[(2\sqrt[3]{2})^3 - (\sqrt[3]{2})^3] - 14 - 2 = 22$

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7. (3-points) Rationalize the denominator and write the answer in simplest form:

$$\frac{2\sqrt{3} - 3\sqrt{2}}{\sqrt{3} + \sqrt{2}}$$

The expression = $\frac{(2\sqrt{3} - 3\sqrt{2})(\sqrt{3} - \sqrt{2})}{(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2})}$... 1 point

$$= \frac{6 - 2\sqrt{6} - 3\sqrt{6} + 6}{3 - 2}$$
 ... 1 point
$$= 12 - 5\sqrt{6}$$
 ... 1 point

8. (4-points) Simplify $\frac{6(x+3)^{-1} - 2(x-1)^{-1}}{x(x-1)^{-1} - 3(x+3)^{-1}}$

The expression = $\frac{\frac{6}{x+3} - \frac{2}{x-1}}{\frac{x}{x-1} - \frac{3}{x+3}}$... 1 point

$$= \frac{6x - 6 - 2x - 6}{-(x+3)(x-1)}$$
 ... 2 points
$$= \frac{4x - 12}{x^2 + 3x - 3x + 3}$$
 ... 1 point
$$= \frac{4x - 12}{x^2 + 3}$$
 ... 1 point

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9. (6-points) Simplify $\frac{x}{9(3x^2+x-2)} - \frac{8}{45(9x^2-4)} - \frac{4}{45(3x+2)(x+1)}$

$$\text{The expression} = \frac{x}{9(3x-2)(x+1)} - \frac{8}{45(3x-2)(3x+2)} - \frac{4}{45(3x+2)(x+1)}$$

--- 1 point

$$= \frac{5x(3x+2) - 8(x+1) - 4(3x-2)}{45(3x-2)(x+1)(3x+2)}$$

--- 2 points

$$= \frac{15x^2 + 10x - 8x - 8 - 12x + 8}{45(3x-2)(x+1)(3x+2)}$$

$$= \frac{15x^2 - 10x}{45(3x-2)(x+1)(3x+2)}$$

--- 1 point

$$= \frac{5x(3x-2)}{45(3x-2)(x+1)(3x+2)}$$

--- 1 point

$$= \frac{x}{9(x+1)(3x+2)}$$

--- 1 point