

CENTRAL WISCONSIN MATHEMATICS LEAGUE

Meet III
March 29, 2001

Category II (Algebra)

1. [2 points each](P) *True/False: Indicate whether each of the following statements is true or false by marking the appropriate box on your answer sheet.*
- (a) $(1 + i)(1 - i) = 2$, where $i^2 = -1$.
 - (b) If $x^3 - 5x - 2$ is divided by $x + 2$, the remainder is 0.
 - (c) Every 2×2 matrix has an inverse under multiplication.
 - (d) $3, 6, 9, 12, \dots$ represents a geometric sequence.
 - (e) The inverse of the function $y = e^{2x}$ is $y = \ln(2x)$.

2–5: *Multiple Choice (4 points each). On your answer sheet, mark "X" in the box for the one best choice.*

2. How many real solutions are there to the system of equations?
$$\begin{cases} x^2 + y^2 - 4 = 0 \\ x^2 - y + 2 = 0 \end{cases}$$

- a. 1
- b. 2
- c. 3
- d. 4
- e. None

3. Simplify: $\left(\frac{x^{-3}y^2}{z}\right)^{-4}$

- a. $\frac{z^4}{x^7y^6}$
- b. $\frac{z^4}{x^7y^2}$
- c. $\frac{x^{12}z^4}{y^8}$
- d. $\frac{z^4}{x^{12}y^8}$
- e. $\frac{x^{12}y^8}{z^{-4}}$

4. Identify the graph of $xy - 1 = 0$.

- a. circle
- b. ellipse
- c. parabola
- d. hyperbola
- e. cone

5. How many different four letter arrangements can be made with the letters in the word MATH, using each letter once?

- a. 2
- b. 4
- c. 8
- d. 16
- e. 24

6–9: Multiple Choice (6 points each). On your answer sheet, mark “X” in the box for the one best choice.

6. In $\triangle ABC$ with right angle C , if angle A measures 30° and $c = 20$ mm, then $\cos A =$

- a. $\sqrt{3}/2$
- b. $1/2$
- c. $1/20$
- d. $2/\sqrt{3}$
- e. $\sqrt{20}$

7. Given the matrices $B = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 1 \\ 0 & 2 \end{bmatrix}$, then $C^2B =$

- a. $-2C$
- b. $6C$
- c. $2B$
- d. $\begin{bmatrix} 0 & 2 \\ 0 & 12 \end{bmatrix}$
- e. $\begin{bmatrix} 0 & 4 \\ 2 & 6 \end{bmatrix}$

8. Solve for x to the nearest hundredth:

$$\log x + \log 6 = 0.3692$$

- a. 0.06
- b. 0.67
- c. 0.39
- d. 2.67
- e. 16.25

9. The spread of a flu virus is modeled by

$$y = \frac{1000}{1 + 990e^{-0.7t}}$$

where y is the total number infected after t days. In how many days will 810 people be infected?

- a. 8 days
- b. 9 days
- c. 10 days
- d. 12 days
- e. 14 days

10–14: Miscellaneous Problems (10 points each). On your answer sheet, write your answer in the blank(s) provided. (P) means that partial credit may be given.

10. Find k such that $x - 3$ is a factor of $x^3 + x^2 + kx - 2k$.

11. (P) The equation $x^2 - 4x + y^2 + 2y = 4$ represents a circle. Find the coordinates of the center (x, y) and the radius r .

12. Solve for x : $7^{6x-2} = 49^{2x-5}$

13. Farmer Gilmore has a farm and on his farm he has a duck, a cow, and a pig. The square of the duck's age is 2 less than the age of the cow. If the pig's age is subtracted from the cow's age, you have the age of the duck. The square of the duck's age is equal to the age of the pig. How old is the cow? *Assume all ages are in years.*

14. A ball is dropped from a height of 16 meters. On the first bounce, it rebounds to a height of 8 meters. After each successive bounce, it rebounds to half the previous rebound height. Find the rebound height after the eighth bounce. *Express your answer as an exact fraction.*

Student's Answer Sheet

Name: _____
PRINT: First Last

School: _____ Code

I participated in: Meet I Meet II Neither

1. True/False (2 points each). Mark X in the box for the correct answer.

	True	False
(a)	<input type="checkbox"/>	<input type="checkbox"/>
(b)	<input type="checkbox"/>	<input type="checkbox"/>
(c)	<input type="checkbox"/>	<input type="checkbox"/>
(d)	<input type="checkbox"/>	<input type="checkbox"/>
(e)	<input type="checkbox"/>	<input type="checkbox"/>

2–5: Multiple Choice (4 points each). Mark X in the box for the one best choice.

	a	b	c	d	e
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6–9: Multiple Choice (6 points each). Mark X in the box for the one best choice.

	a	b	c	d	e
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10–14: Miscellaneous Problems (10 points each). Write your answer in the blank(s) provided; the boxes at the right are for grading use only. (P) means that partial credit may be given.

10. $k =$ _____

10	
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11. $(x = \text{_____}, y = \text{_____})$

10P	
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$r =$ _____

12. $x =$ _____

10	
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13. _____ years old

10	
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14. _____ meters

10	
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FOR GRADING USE ONLY

#1: _____ correct $\times 2 =$ _____

#2–5: _____ correct $\times 4 =$ _____

#6–9: _____ correct $\times 6 =$ _____

#10–14: _____ total = _____

TOTAL SCORE

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