

# MATH 1110 UNIFORM FINAL EXAM

May 5 , 2007

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Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Circle your section and instructor:

001	002	003
B. MacMillan Mon/Wed 11:30-12:45	J. Larson Mon/Wed 8:30-9:45	O. Jenkins Tue/Thur 10:00-11:15

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## Directions:

1. Complete the section above.
  2. Put your name on **Page 1** of the test.
  3. Show all work where indicated and be neat! If we can not follow your work, you will not receive any credit.
  4. When you are finished with the "non-calculator" portion of the exam, bring it to your instructor for the "calculator" part.
  5. If you are confused about what a problem is asking, ask your instructor. You may not ask for hints or a verification on how you have completed a problem.
  6. You are not allowed notes on this exam.
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## DO NOT WRITE IN THIS SPACE

Page 1. (31 pts)	Page 2. (20 pts)	Page 3. (19 pts)	Page 4. (23 pts)
Page 5. (24 pts)	Page 6. (9 pts)	Page 7. (12 pts)	Page 8. (12 pts)

TOTAL: \_\_\_\_\_ (out of 150 points)

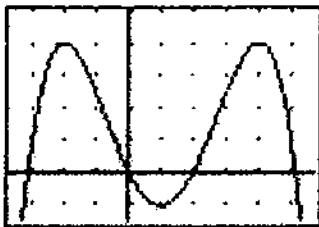
SCORE: _____ / 150
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Name \_\_\_\_\_

**Part I: Short answer questions. No work is required.**

1. ( 2 points ) A horizontal line goes through the point  $(-3, 6)$ .
  - a. The slope of the line is \_\_\_\_\_
  - b. The equation of the line is \_\_\_\_\_
2. ( 2 points ) The product of  $-1-3i$  and its conjugate is \_\_\_\_\_
3. ( 2 points ) The slope of the line that is perpendicular to  $5x + 2y = -7$  is \_\_\_\_\_
4. ( 3 points ) The solution of the equation  $|5x - 4| = 2$  is  $x =$  \_\_\_\_\_

5. ( 6 points ) Given the graph of a function  $f$  below. Each mark represents one unit.



- a. On what interval(s) is  $f(x) \geq 0$ ? \_\_\_\_\_
- b. On what interval(s) is  $f$  increasing? \_\_\_\_\_
- c. On what interval(s) is  $f$  decreasing? \_\_\_\_\_

6. ( 2 points ) The graph of the function  $f(x) = \sqrt{x}$  is shifted to the left 1 unit, reflected through the  $x$ -axis, and shifted up 2 units. The resulting equation is:

$$y = \underline{\hspace{4cm}}$$

7. ( 4 points ) Given that the roots of polynomial function  $f$  of degree 3 are  $x = -2$ ,  $x = 4i$ , and  $x = -4i$ ,
  - a. Write an expression, in factored form, of  $f$ .  $f(x) =$  \_\_\_\_\_
  - b. Write  $f$  in standard form.  $f(x) =$  \_\_\_\_\_

8. ( 2 points ) Write the exponential equation  $4^n = 3x$  in logarithmic form. \_\_\_\_\_

9. ( 2 points ) Write the logarithmic equation  $\ln(6z) = m$  in exponential form. \_\_\_\_\_

10. ( 6 points ) Find the exact value of the following logarithmic expressions.

$$\text{a. } \log 0.001 = \underline{\hspace{2cm}} \quad \text{b. } \log_5 \sqrt{5} = \underline{\hspace{2cm}} \quad \text{c. } \log_4 48 - \log_4 3 = \underline{\hspace{2cm}}$$

Part Two: Show all work on the following problems.

11. ( 5 points ) Solve the equation  $\sqrt{2x-3} = 3-x$ . Don't forget to check for extraneous solutions.

12. ( 5 points ) Find an equation of a line that is parallel to the line  $3x + 4y = 5$  that goes through the point  $(-3, 4)$ . Write your answer in slope-intercept form.

13. ( 6 points ) The endpoints of the diameter of a circle are  $(7, 2)$  and  $(1, -6)$ . Find the center and radius of the circle. Then write the equation of the circle.

Center: \_\_\_\_\_ Radius: \_\_\_\_\_

Equation: \_\_\_\_\_

14. ( 4 points ) Find the center and radius of the circle whose equation  $x^2 + y^2 - 16x + 6y - 8 = 0$ .

Center: \_\_\_\_\_ Radius: \_\_\_\_\_

15. (8 points) Given  $f(x) = x^2 - 2x + 1$

a. Evaluate  $\frac{f(x+h) - f(x)}{h}$  and simplify.

b. If  $f(x) = 4$ , what are the values of  $x$ ?

$x =$  \_\_\_\_\_

c. Find the average rate of change of  $f$  from  $x = 1$  to  $x = 4$ .

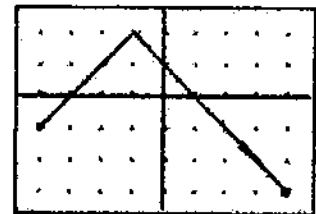
16. (5 points) The entire graph of function  $f$  is shown to the right.

Find the following:

a.  $f(3) =$  \_\_\_\_\_

b. The domain and range of  $f$ .

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

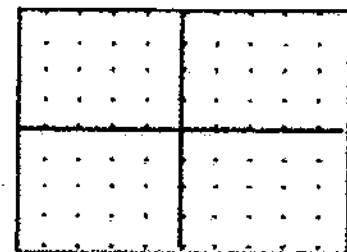
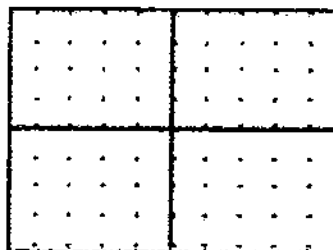
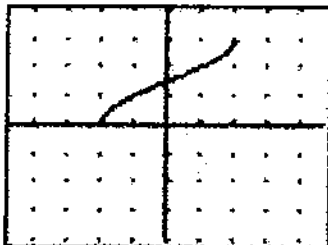


17. The entire graph of function  $g$  is shown below.

(3 points each) Sketch the graph of the functions:

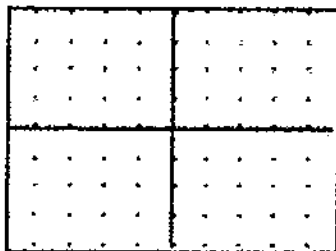
a.  $y = g(x+1) - 3$

b.  $y = g^{-1}(x)$ , the inverse of  $g(x)$ .

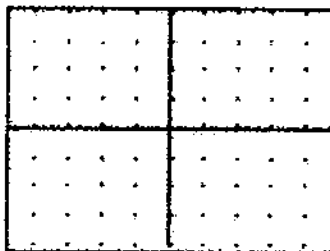


18. (3 points each) Sketch a graph of the following functions. Show asymptotes with dotted lines

a.  $f(x) = -\frac{1}{x} - 1$

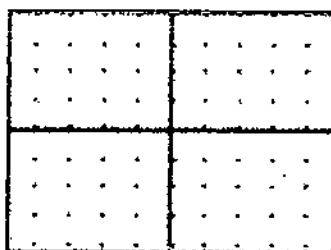


b.  $f(x) = -\ln(x+1)$



19. (5 points) Graph the following piecewise defined function.

$$f(x) = \begin{cases} -x-1 & \text{if } x < -1 \\ -x^2 & \text{if } -1 \leq x \leq 1 \\ -1 & \text{if } x > 1 \end{cases}$$



20. (8 points) Given  $f(x) = 4x^2 - 4x - 3$

a. Find the coordinates of the vertex.

Vertex: \_\_\_\_\_

b. Find all intercepts and write them as ordered pairs.

Intercepts: \_\_\_\_\_

21. (4 points) If  $f(x) = 3x - 2$  and  $g(x) = \frac{4x+1}{2x-3}$ , find the following.

a.  $f(g(1)) =$  \_\_\_\_\_

b.  $g(f(x)) =$  \_\_\_\_\_

22. (12 points) Given  $f(x) = \frac{x^2 - 4}{2x^2 - x - 1}$ .

a. Write the intercepts (as ordered pairs). x-intercepts: \_\_\_\_\_

y-intercept: \_\_\_\_\_

b. Write equations of the asymptotes. Horizontal asymptotes: \_\_\_\_\_

Vertical asymptotes: \_\_\_\_\_

23. (4 points) If  $f(x) = -\frac{4}{3x+1}$ , find  $f^{-1}(x)$ .  $f^{-1}(x) =$  \_\_\_\_\_

24. (4 points) Algebraically, solve the following equation. Be sure to show all work.

$$\log_2 x + \log_2(x-3) = 2$$

25. (4 points) Solve the system of equations  $\begin{cases} 4x - 5y = -19 \\ 3x + 7y = 18 \end{cases}$

26. (3 points each) Evaluate each of the following matrix problems. If a problem can not be done, write "NOT POSSIBLE".

$$\text{Let } A = \begin{bmatrix} -2 \\ 1 \\ 3 \end{bmatrix}, B = \begin{bmatrix} 4 \\ -2 \\ -1 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 3 & -1 \\ 2 & -1 & 0 \end{bmatrix}, D = [-2 \ 3 \ 1]$$

a.  $3A - B =$

b.  $A \cdot D =$

c.  $C \cdot A =$

**When you are finished with this part of the exam, bring it to the front and get the calculator part of the test.**

Name \_\_\_\_\_

**Part Three: You may use your graphing calculator on this part of the exam.**27. ( 2 points ) Evaluate  $\log_{12} 3567$  . Round your answer to two decimal places. \_\_\_\_\_28. ( 6 points ) Given the function  $f(x) = 2x^3 - 6x^2 + 5x - 2$ .a. Sketch the graph of  $f$  .b. The real zero of  $f$  isc. Find the remaining complex zeros.  
Show all of your work.

\_\_\_\_\_

29. ( 4 points ) Algebraically, solve the following equation. Be sure to show all work. Write your answer in terms of logarithms and then as a decimal rounded to two decimal places. Show all of your work.

$$3^{2x-5} = 40$$

x = \_\_\_\_\_