

MATH 1110 UNIFORM FINAL EXAM

May 8 , 2004

Name: _____

Student Number: _____

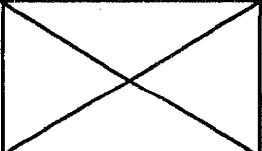
Circle your section and instructor:

| 001 | 002 | 003 | 004 | OL1 |
|----------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|---------------------|
| C. Jabri Mon/Wed 8:30-9:45 | B. MacMillan Mon/Wed 1:00-2:15 | D. Gryboski Tue/Thur 1:00-2:15 | N. LeMay Tue/Thur 4:00-5:15 | R. Byrne On Line |

Directions:

1. Complete the section above.
2. Put your name on **Page 1** of the test. You should have **7** pages of this test.
3. Show all work and be neat! If we can not follow your work, you will not receive any credit.
4. 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.
5. You are not allowed notes, calculators or computers.

DO NOT WRITE IN THIS SPACE

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|------------------|------------------|------------------|---------------------------------------------------------------------------------------|
| Page 1. (16 pts) | Page 2. (25 pts) | Page 3. (19 pts) | Page 4. (24 pts) |
| Page 5. (32 pts) | Page 6. (20 pts) | Page 7. (14 pts) |  |

TOTAL: _____ (out of 150 points)

Name _____

(5 points) Solve the equation $\sqrt{2x+7} = x+2$. Be careful to check for extraneous solutions.

2. (5 points) Find an equation of a line that is perpendicular to the line $y = \frac{2}{3}x - 5$ that goes through the point $(4, -1)$.

Write your answer in slope-intercept form.

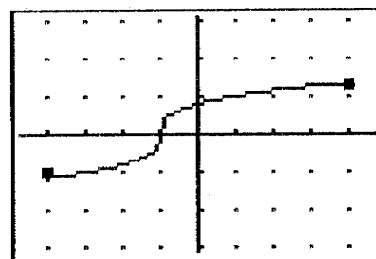
3. (6 points) The endpoints of the diameter of a circle are $(-8, -9)$ and $(-2, 1)$. Find the center and radius of the circle. Then write the equation of the circle.

Center: _____

Radius: _____

Equation: _____

4. (13 points) The entire graph of function f is shown.



Find the following:

a. $f(-4) =$ _____

b. Write, as an ordered pair, the x-intercept and y-intercept of f .

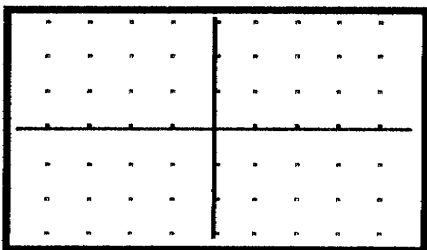
x-intercept: _____ y-intercept: _____

c. The domain and range of f .

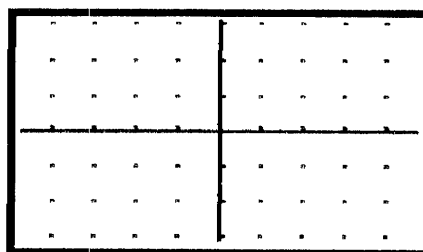
Domain: _____ Range (Approximate) : _____

d. Sketch the graph of the function;

i. $y = -f(x-1)$

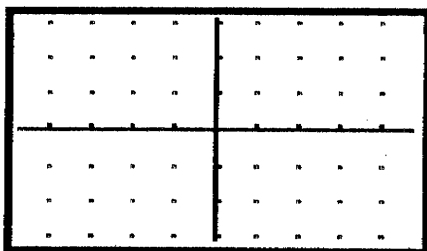


ii. $y = f^{-1}(x)$, the inverse of $f(x)$.

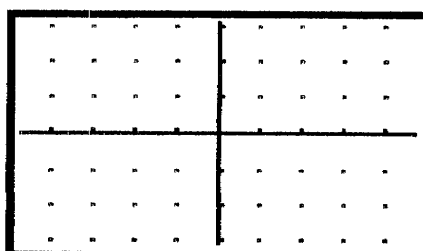


5. (3 points each) Sketch a graph of the following functions.

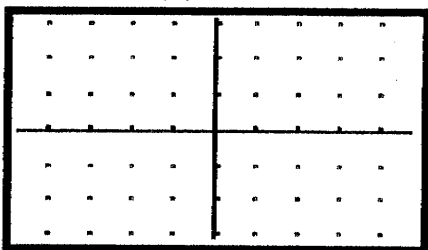
a. $f(x) = -x^2 + 2$



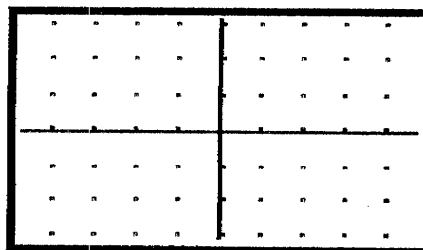
b. $f(x) = \sqrt{x+2}$



c. $f(x) = \left(\frac{4}{3}\right)^x$



c. $f(x) = \ln x$



6. (4 points) If $f(x) = 2x^2 - 12x + 19$, find the coordinates of the vertex.

Vertex is (_____ , _____)

7. (5 points) If $f(x) = \frac{2x}{x-3}$ and $g(x) = x^2 + 1$, find the following.

a. $g(f(-3)) =$ _____

b. $f(g(x)) =$ _____

8. (6 points) The graph of $f(x) = 3(x-2)^2 - 4$ can be obtained from the graph of $g(x) = x^2$. State the transformations that you would apply to function g to obtain the graph of f .

9. (4 points) Write $\frac{2+3i}{1-i}$ in the form $a + bi$.

10. (5 points) Given that the roots of a polynomial function f of degree 3 are $x = 5$, $x = 2i$, and $x = -2i$,

a. Write an expression, in factored form, of f . $f(x) =$ _____

b. Multiply the factors and write it in standard form. $f(x) =$ _____

11. (12 points) Given $f(x) = \frac{4x^2 - 1}{x^2 + 3x + 2}$.

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

y-intercept: _____

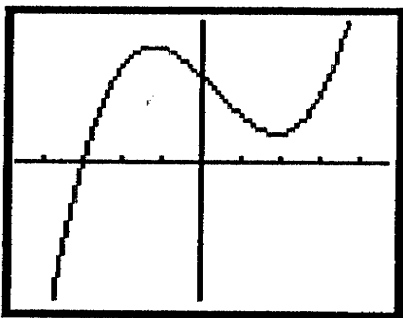
b. Write equations of the asymptotes. Horizontal asymptotes: _____

Vertical asymptotes: _____

12. (7 points) Given the function $f(x) = x^3 - x^2 - 7x + 15$.

a. Using the Rational Zero theorem, list all possible rational zeros of f .

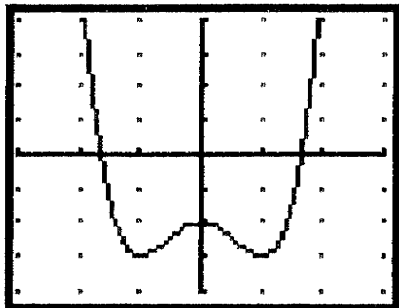
b. The complete graph of f is shown below.



c. The real zero of f is _____

d. Find the remaining complex zeros.

13. (8 points) Given the graph of f shown below



- a. Find all local maximum and minimum values of f .

Max: _____ Min: _____

- d. Write the intervals where f is increasing and decreasing.

Increasing: _____

Decreasing: _____

14. (5 points) If $f(x) = \frac{3}{x-4}$, find $f^{-1}(x)$. $f^{-1}(x) =$ _____

15. (3 points) Write the exponential equation $x^\pi = e$, in its logarithmic form. _____

16. (3 points each) Find the exact value of the following logarithmic expressions.

a. $\log_3 81 =$

b. $\log 5 - \log 500 =$

c. $\log_{25} 5 =$

17. (4 points) Solve the following equation. Be sure to show all work. Leave answer in terms of logarithms.

$$e^{2x+1} = 50$$

18. (4 points) Solve the following equation. Be sure to show all work.

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

19. (6 points) A radioactive substance decays according to the rule $A(t) = 4000e^{-0.02t}$.

a. How much of the substance is present initially? _____

b. Find the half-life of the substance. Leave your answer in terms of logarithms.

20. (5 points) A culture of bacteria obeys the law of exponential growth. ($N(t) = N_0e^{kt}$). 800 bacteria are present initially, and there are 1200 after one hour. Find the value of k . Leave your answer in terms of logarithms.

21. (5 points) Solve the system of equations
$$\begin{cases} 3x - 6y = 2 \\ 5x + 4y = 1 \end{cases}$$

22. (5 points) At the Pittsburgh Zoo, children ride a train for 75 cents, adults pay \$3.00, and senior citizens pay \$2.25. On a given day, 1400 passengers paid a total of \$1480 for the rides. There were 250 more children ride the train than the total number of adults and senior citizens. Write a system of equations you could use to find the number of children (C), the number of adults (A), and the number of senior citizens (S) that rode the train that day. Then write the system as an augmented matrix. (You do not need to solve the system of equations.)

System:

Matrix:

23. (3 points each) Evaluate each of the following matrix problems. If a problem can not be done, write NOT POSSIBLE.

a. $3 \begin{bmatrix} -4 & 2 \\ -1 & 3 \end{bmatrix} - 2 \begin{bmatrix} 1 & -4 \\ 2 & -7 \end{bmatrix}$

b. $\begin{bmatrix} 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 \\ 2 & 1 \\ 3 & 2 \end{bmatrix} \cdot \begin{bmatrix} 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$