

# MATH 1110 UNIFORM FINAL

## DECEMBER 7, 2002

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

Circle your section number:

001	002	003	004	005	006	OL1
J. Cowell Mon/Wed 10:00-11:15	D. Shepherd Mon/Wed 1:00-2:15	D. Shepherd Mon/Wed 5:30-6:45	H. Mardones Tues/Thurs 8:30-9:45	N. Lemay Tues/Thurs 11:30-12:45	N. Lemay Tues/Thurs 2:30-3:45	R. Byrne online

**Directions:**

1. Fill in the section above.
2. Make sure you put your name on this sheet and the first page of the test.
3. Read each question carefully and make sure you answer what is being asked.
4. You are allowed a 4" by 6" piece of paper or note card for notes. Calculators are allowed.
5. If you are confused about what a problem is asking, ask your instructor. You may not ask for hints or verification of information on your note card.
6. If you need more room, write on the back of the page telling the grader that you have done so.
7. On problems 22-31 Show all your work and be neat. If the grader cannot follow your work, you will not receive any credit.
8. Place your answers to the multiple choice problems on the line provided.

**DO NOT WRITE IN THIS SPACE**

1-21 Pages 1-5 multiple choice questions 2 points each, total (42)			
22 A (4)	22 B (4)	22 C (4)	22 D (4)
23 (8)	24 (6)		
25 (8)	26 (8)	27 (8)	
28 (6)	29 (6)	30 (6)	31 (6)
<b>Total:</b> (120)			

Name \_\_\_\_\_

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

Solve the equation.

1)  $\sqrt{q+4} = 4$

A) {16}

B) {12}

C) {20}

D) {64}

1) \_\_\_\_\_

2)  $3|x-3| = 18$

A) {9, -3}

B) {3}

C) no solution

D) {3, -9}

2) \_\_\_\_\_

Write the standard form of the equation for the circle.

3) Give the equation for a circle.

Center at (4, 3), radius  $\sqrt{2}$ 

A)  $(x+3)^2 + (y+4)^2 = 4$

B)  $(x-4)^2 + (y-3)^2 = 2$

C)  $(x+4)^2 + (y+3)^2 = 2$

D)  $(x-3)^2 + (y-4)^2 = 4$

3) \_\_\_\_\_

Decide whether the relation defines a function.

4) Which of the following is a function?

A)  $\{(-8, -3), (7, 4), (7, -8), (4, 7)\}$

B)  $\{(-8, -3), (-3, 7), (-8, 4)\}$

C)  $\{(-8, -3), (-3, -8), (4, 4)\}$

D)  $\{-8, -3, 7, 4\}$

4) \_\_\_\_\_

Evaluate the function.

5) Find  $f(a+3)$  when  $f(x) = x^2 - 5$ .

A)  $a^2 + 6a + 9$

B)  $a^2 + 6a + 4$

C)  $a^2 + 9$

D)  $a^2 - 2$

5) \_\_\_\_\_

Solve the problem.

6) Evaluate the expression  $3f(-2) + 4f(2) + 5f(0)$ , given  $f(x) = \begin{cases} 2x-3 & \text{if } x < 0 \\ x+1 & \text{if } x \geq 0 \end{cases}$ 

A) 28

B) -4

C) 18

D) -16

6) \_\_\_\_\_

Find the indicated composite for the pair of functions.

7)  $(f \circ g)(x)$ :  $f(x) = 6x + 11$ ,  $g(x) = 5x - 1$ 

A)  $30x + 10$

B)  $30x + 17$

C)  $30x + 54$

D)  $30x + 5$

7) \_\_\_\_\_

Determine the domain of the rational expression.

8)  $R(x) = \frac{3x^2 - 5x - 2}{x^2 - 4}$

A) all real numbers except -2

B) all real numbers except 2

C) all real numbers except 2 and -2

D) all real numbers

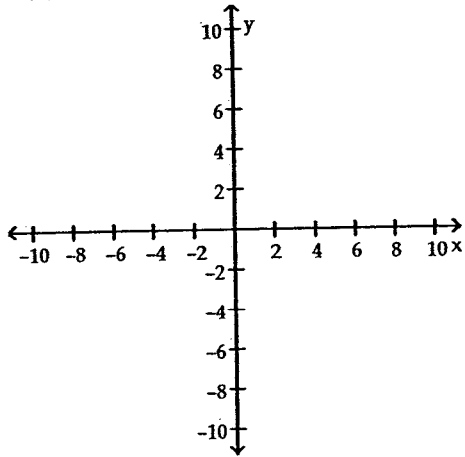
8) \_\_\_\_\_

Name \_\_\_\_\_

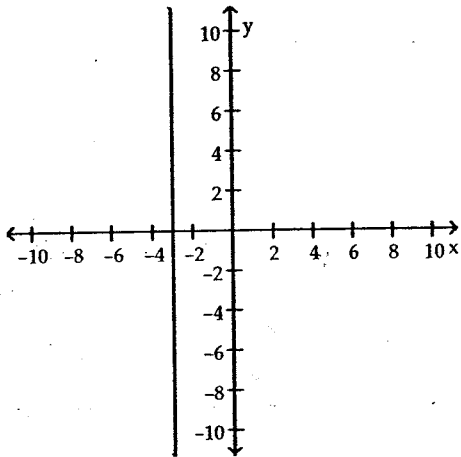
Graph the linear function by hand.

9) \_\_\_\_\_

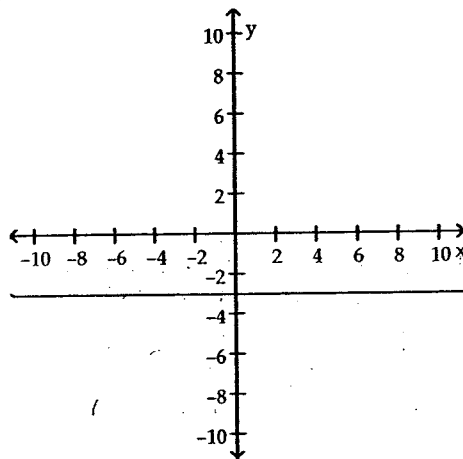
9)  $G(x) = -3$



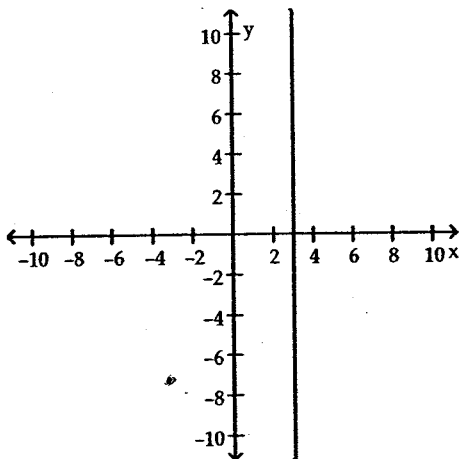
A)



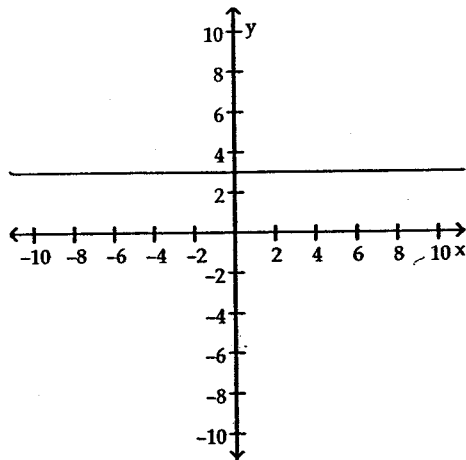
B)



C)



D)



Name \_\_\_\_\_

For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept.

10)  $f(x) = (x + \frac{1}{4})^4 (x - 3)^3$

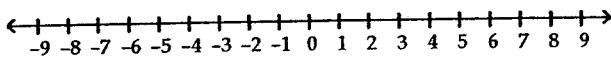
10) \_\_\_\_\_

- A)  $-\frac{1}{4}$ , multiplicity 4, touches x-axis; 3, multiplicity 3, crosses x-axis
- B)  $\frac{1}{4}$ , multiplicity 4, touches x-axis; -3, multiplicity 3, crosses x-axis
- C)  $-\frac{1}{4}$ , multiplicity 4, crosses x-axis; 3, multiplicity 3, touches x-axis
- D)  $\frac{1}{4}$ , multiplicity 4, crosses x-axis; -3, multiplicity 3, touches x-axis

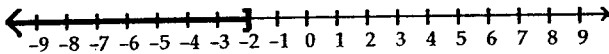
Solve the inequality, then graph its solution. Use interval notation.

11) \_\_\_\_\_

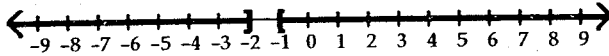
11)  $x^2 + 3x \geq -2$



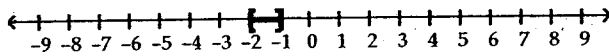
A)  $(-\infty, -2]$



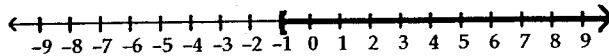
B)  $(-\infty, -2]$  or  $[-1, \infty)$



C)  $[-2, -1]$



D)  $[-1, \infty)$



List the potential rational zeros of the polynomial function. Do not find the zeros.

12) \_\_\_\_\_

12)  $f(x) = 11x^4 - x^2 + 2$

A)  $\pm \frac{1}{2}, \pm \frac{11}{2}, \pm 1, \pm 11$

B)  $\pm \frac{1}{11}, \pm \frac{2}{11}, \pm 1, \pm 2$

C)  $\pm \frac{1}{11}, \pm \frac{1}{2}, \pm 1, \pm 2, \pm 11$

D)  $\pm \frac{1}{11}, \pm \frac{2}{11}, \pm 1, \pm 2, \pm 11$

Perform the indicated operation. Write result in standard form.

13) \_\_\_\_\_

13)  $7i(8 - 2i)$

A)  $56i - 14i^2$

B)  $14 + 56i$

C)  $56i + 14i^2$

D)  $56i - 14$

Solve the equation in the complex number system.

14) \_\_\_\_\_

14)  $x^2 + x + 4 = 0$

A)  $\left\{ \frac{1 \pm \sqrt{15}}{2} \right\}$

B)  $\left\{ \frac{-1 \pm \sqrt{15}}{2} \right\}$

C)  $\left\{ \frac{1}{2} \pm \frac{\sqrt{15}}{2}i \right\}$

D)  $\left\{ \frac{-1}{2} \pm \frac{\sqrt{15}}{2}i \right\}$

Name \_\_\_\_\_

If the following defines a one-to-one function, find the inverse.

15)  $\{(-16, -11), (16, -11), (-17, 9)\}$

A)  $\{(-16, -11), (-11, 16), (9, -17)\}$

C)  $\{(-11, -16), (-11, 16), (9, -17)\}$

B)  $\{(-11, -16), (-17, 16), (9, -11)\}$

D) Not a one-to-one function

15) \_\_\_\_\_

Change exponential expressions to logarithmic expression

16)  $2.3^{x+5} = 15$

A)  $\log_{2.3} x = 10$

C)  $\log_{(x+5)} 15 = 2.3$

B)  $\log_{2.3} 15 = x + 5$

D)  $\log_{15} (x + 5) = 2.3$

16) \_\_\_\_\_

Solve the problem.

17)  $\log_4 x = 3$

A)  $\{7\}$

B)  $\{81\}$

C)  $\{64\}$

D)  $\{12\}$

17) \_\_\_\_\_

Express as a single logarithm.

18)  $3 \log_b m - \log_b n$

A)  $\log_b \frac{m^3}{n}$

C)  $\log_b m^3 \div \log_b n$

B)  $\log_b \frac{3m}{n}$

D)  $\log_b (m^3 - n)$

18) \_\_\_\_\_

Write the augmented matrix for the system.

19) 
$$\begin{cases} 8x + 3z = 22 \\ 5y + 5z = 40 \\ 7x + 8y + 6z = 74 \end{cases}$$

A) 
$$\left[ \begin{array}{ccc|c} 8 & 0 & 3 & 22 \\ 0 & 5 & 5 & 40 \\ 7 & 8 & 6 & 74 \end{array} \right]$$

B) 
$$\left[ \begin{array}{ccc|c} 8 & 3 & 0 & 22 \\ 5 & 5 & 0 & 40 \\ 7 & 8 & 6 & 74 \end{array} \right]$$

C) 
$$\left[ \begin{array}{ccc|c} 8 & 0 & 7 & 22 \\ 0 & 5 & 8 & 40 \\ 3 & 5 & 6 & 74 \end{array} \right]$$

D) 
$$\left[ \begin{array}{ccc|c} 8 & 0 & 3 & 22 \\ 0 & 5 & 5 & 40 \\ 7 & 8 & 6 & 74 \end{array} \right]$$

19) \_\_\_\_\_

Solve the system of equations.

20) 
$$\begin{cases} x + y + z = 8 \\ x - y + 4z = 5 \\ 3x + 3y + 3z = 16 \end{cases}$$

Determine the type of solution to the above system

A) unique solution

B) Only 2 solutions

C) infinitely many solutions

D) Inconsistent,  $\emptyset$

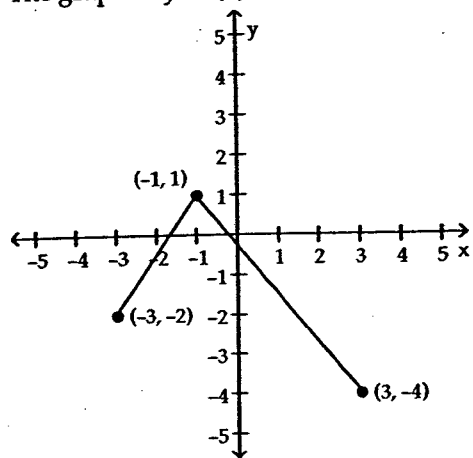
20) \_\_\_\_\_

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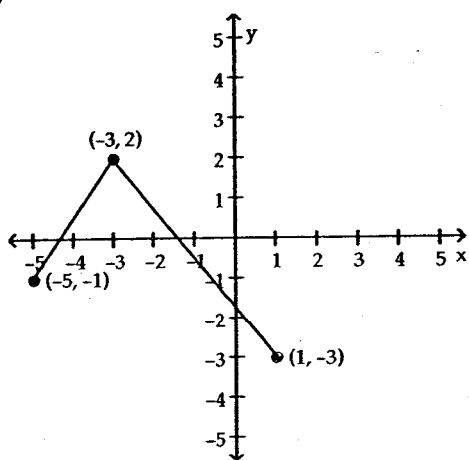
Using transformations, sketch the graph of the function.

21) The graph of  $y = f(x)$  is as shown. Sketch the graph of  $y = f(x + 2) - 1$

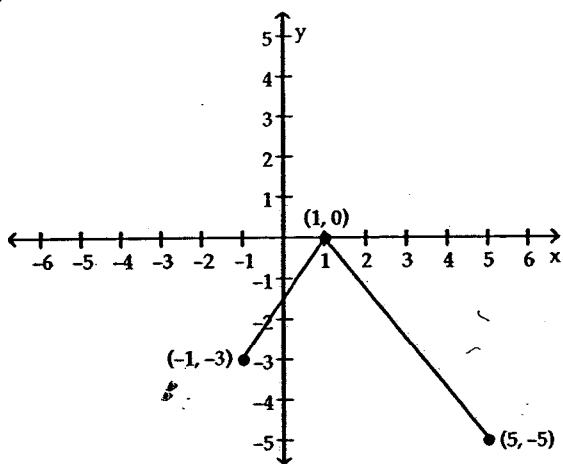
21) \_\_\_\_\_



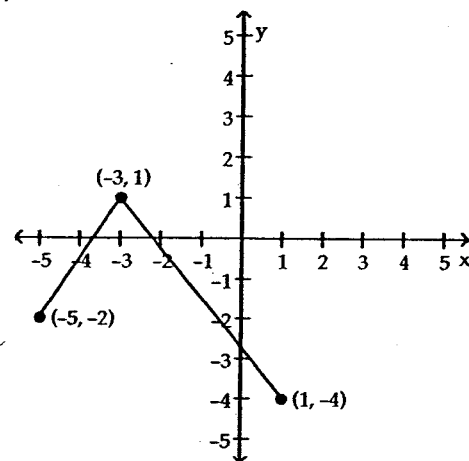
A)



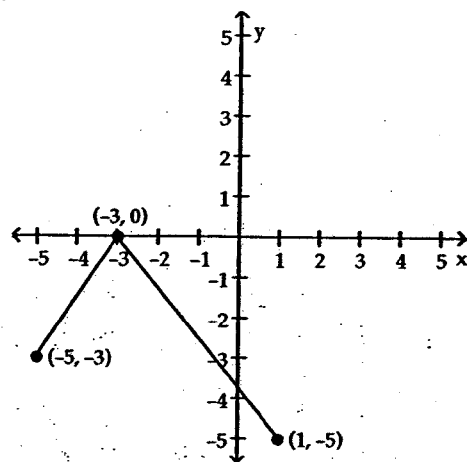
B)



C)



D)



**\*\*\*\*SHOW ALL YOUR WORK\*\*\*\***  
**\*\*ROUND DECIMAL ANSWERS TO 2 DECIMAL PLACES\*\***

**22. (16 pts.) Solve each of the following:**

**A)  $4 < 2x + 2 \leq 10$  Write your answer in interval notation.**

**B)  $x^4 - 7x^2 + 12 = 0$  Exact answers no decimals. (Hint: Factor)**

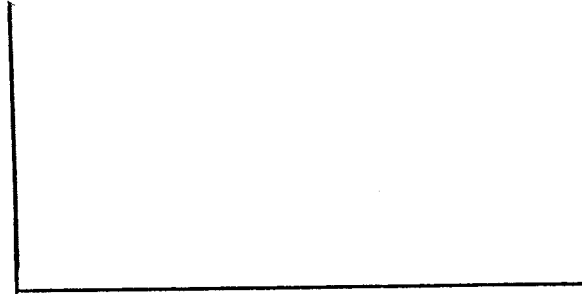
**C)  $3.5^{2x-1} = 50$  Write your final answer as a decimal correct to two decimal places.**

**D)  $\log_3(x+2) - \log_3 x = 2$  Write the exact answer as a reduced fraction.**

23. (8 pts.) The following chart gives some data for a given number of people to do the wave.

Number of people	3	8	15	20	28
Time in seconds	5	13.2	25	30.4	44.1

a) Use a graphing utility to do a scatter diagram. Put appropriate labels on your graph.



b) Use the ordered pairs (3, 5) and (15, 25) to find the equation of a line that should fit the data reasonably well. Write your answer in slope intercept form.

$$y = \text{-----}$$

c) Interpret the slope. (What is the real world meaning of the slope in the context of this problem?)

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d) Use a graphing utility to find the line of best fit to the data. ( round coefficients to 2 decimal places.)

$$y = \text{-----}$$

e) Use the answer to part (d) to find the time for 50 people to do a wave. \_\_\_\_\_

24. (6 pts.) If  $f(x) = -3x^2 + 12x - 8$ , algebraically find the exact coordinates of the vertex.

Vertex: ( \_\_\_\_\_ , \_\_\_\_\_ )

25.(8 pts) Given the rational function  $G(x) = \frac{x^2 + 2x - 15}{x + 4}$

a) State the Domain

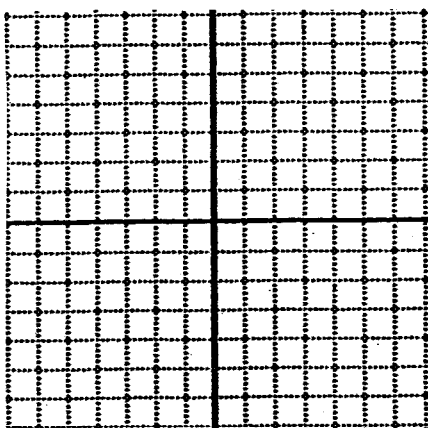
b) Find the intercepts

c) Write the equation of the vertical asymptote.

d) Write the equation of any horizontal or oblique asymptote. (end behavior asymptote)

26.(8 pts.) Given the polynomial function  $f(x) = x^3 - 4x^2 - 2x + 20$

a) Draw a complete graph, with appropriate labels on your graph.



b) The real zero is: \_\_\_\_\_

c) Find all local minimum and maximum points.

Min: ( \_\_\_\_\_ , \_\_\_\_\_ )

Max: ( \_\_\_\_\_ , \_\_\_\_\_ )

d) Write the intervals where the function is increasing or decreasing.

Increasing: \_\_\_\_\_

Decreasing: \_\_\_\_\_

27. (8 pts.) a) If  $f(x) = \sqrt{x+5}$ , find  $f^{-1}(x)$

b) Domain of f: \_\_\_\_\_

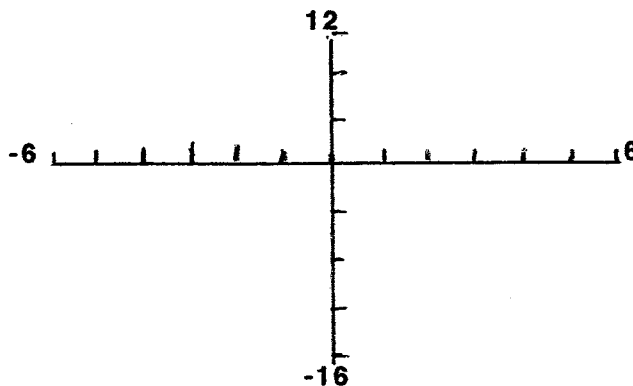
c) Range of f: \_\_\_\_\_

d) Domain of  $f^{-1}$  : \_\_\_\_\_

$f^{-1}(x) =$  \_\_\_\_\_

28. (6 pts.) State the transformations for  $f(x) = -3(2^{x-1}) - 2$  and sketch the graph if the parent function is  $y = 2^x$

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_



29. (6 pts.) Only do problem A or problem B.

A) How many years will it take for an investment \$40,000 to grow to \$150,000. Assume a rate of interest of 6.5% compounded continuously.

B) The half-life of radioactive cobalt is 5.27 years. If 100 grams of radioactive cobalt is present now, how much will be present in 35 years? (Hint: Use the formula  $A = A_0 e^{kt}$ , find  $k$ )

30. (6 pts.) Solve the following system using matrices. Show the set-up you used and state the final answers as fractions.

$$\begin{cases} 2x - y + z = -4 \\ x + 2y - 3z = 9 \\ 3x - 2y + z = -3 \end{cases}$$

$x =$  \_\_\_\_\_  $y =$  \_\_\_\_\_  $z =$  \_\_\_\_\_

31. (6 pts.) The population of deer after  $t$  years in Cedar State Park is modeled by the function

$$P(t) = \frac{1001}{1 + 90e^{-0.2t}}$$

- a) What is the carrying capacity of this preserve? \_\_\_\_\_
- b) What is the initial population of deer? \_\_\_\_\_
- c) When will the number of deer be 600? \_\_\_\_\_