

# Math 940 Midterm

## Version 4 - Practice

### Course Learning Objectives:

- 1) Solve certain types of linear, polynomial and rational equations and inequalities.
- 2) Model applications based on the types of equations and inequalities listed in 1).
- 3) Demonstrate appropriate manipulation of rational expressions.
- 4) Graph linear equations and model applications based on these equations and their graphs.
- 5) Demonstrate appropriate manipulation of function notation and be able to find the domain, range, and transformations of a function.
- 6) Solve systems of linear equations using matrices, and modeling applications based on linear systems.

Covers Sections 3.3-3.6, 8.1-8.4, 9.1-9.4, 4.1-4.5, Appendix E, 6.1-6.5, 7.1-7.7 from the textbook.

## Math 940 Midterm

Name \_\_\_\_\_

## Version 4 - Practice

Directions: You must show all work except on multiple choice questions.

## Multiple Choice: Problems 1 - 8

(2 pts each)

- Express the solution to the compound inequality  $x < -2$  OR  $x \geq 1$  in interval notation.  
 a)  $(-2, 1]$       b)  $(-\infty, \infty)$       c)  $(-\infty, -2)$       d)  $[1, \infty)$   
 e)  $(-\infty, -2) \cup [1, \infty)$
- Express the solution to the compound inequality  $x > 4$  AND  $x \geq 2$  in interval notation.  
 a)  $[2, 4)$       b)  $(4, \infty)$       c)  $(-\infty, 2]$       d)  $(-\infty, 2] \cup (4, \infty)$       e) none of these
- Let  $g$  be the function  $g = \{(-2, 2), (-1, 1), (0, 3), (1, 1), (2, 4)\}$ . Then the range of  $g$  is :  
 a)  $\{1, 2, 3, 4\}$       b)  $\{-2, -1, 0, 1, 2\}$       c)  $[-2, 2]$       d)  $[1, 4]$       e) none of these
- Factor  $64x^3 - 27 =$   
 a)  $(4x - 3)^3$       b)  $(4x - 3)(16x^2 - 12x + 9)$       c)  $(4x - 3)(16x^2 + 12x + 9)$   
 d)  $(4x - 3)(16x^2 + 12x - 9)$       e) none of these
- Let  $g$  be the function  $g = \{(2, 5), (3, 4), (4, 6), (5, 4), (6, 7)\}$ . Then for what value of  $x$  does  $g(x) = 6$ ?  
 a) 4      b) 5      c) 7      d) undefined      e)  $\{2, 3, 4, 5, 6\}$
- Find the value of  $f(-3)$  if  $f(x) = \begin{cases} 2x - 1 & \text{if } x < -3 \\ 5 & \text{if } -3 \leq x < 2 \\ x + 1 & \text{if } x \geq 2 \end{cases}$   
 a)  $-7$       b) 5      c)  $-2$       d)  $-1$       e) None
- Which values of  $x$  make the function  $f(x) = \frac{x+3}{x-7}$  undefined?  
 (a) 7      (b)  $-3$       (c)  $-3$  and 7      (d)  $-7$  and 3      (e) None of these
- What is the domain of the linear function  $f(x) = 5 - 4x$ ?  
 (a)  $\{5\}$       (b)  $(-\infty, 5]$       (c)  $[5, \infty)$       (d)  $(-\infty, \infty)$       (e) None of these

**Show all your work.**

9. Solve for  $x$ :  $|3x - 5| = |x - 4|$

3 pts

10. Solve for  $x$ : Express your answer in interval notation

$|5x - 2| \leq 4$

3 pts

11. Solve for  $x$ : Express your answer in interval notation

$|3 - 2x| > 7$

3 pts

12. Solve for  $x$ : Express your answer in interval notation.

8 pts

a)  $|4x - 5| \leq -1$  \_\_\_\_\_

b)  $|4x - 5| = -2$  \_\_\_\_\_

c)  $|4x - 5| > -1$  \_\_\_\_\_

d)  $|4x - 5| > 0$  \_\_\_\_\_

13. Let  $f(x) = -x^2 + 2x + 1$ . Completely simplify each answer.

4 pts

a)  $f(-1) =$

b) Find and simplify completely the difference quotient  $\frac{f(a+h)-f(a)}{h}$

14. The number of cellular subscribers  $f(x)$  (in millions) in the United States can be estimated by the linear equation  $f(x) = 17.7x + 44.9$ , where  $x$  is the number of years after 1997.

a) Find the  $y$ -intercept of this linear function and interpret its meaning in this problem situation. 4 pts

b) Find the slope of this linear function and interpret its meaning in this problem situation. 4 pts

c) Predict the number of cellular subscribers in the United States in the year 2010. 1 pt

15. Solve the following systems for  $(x, y)$ :

4 pts

a) 
$$\begin{aligned} 3x + 6y &= 9 \\ 4x + 8y &= 16 \end{aligned}$$

b) 
$$\begin{aligned} \frac{1}{4}x - 2y &= 1 \\ x - 8y &= 4 \end{aligned}$$

16. Solve the system for  $(x, y, z)$  :

4 pts

$$\begin{aligned} 7x + 4y &= 10 \\ x - 4y + 2z &= 6 \\ y - 2z &= -1 \end{aligned}$$

17. Use matrices and row operations to solve this linear system. No credit will be given for any other method. Express the solution as an ordered triple. 5 pts

$$\begin{array}{rclcl} 4x & + & y & + & z & = & 3 \\ -x & + & y & - & 2z & = & -11 \\ x & + & 2y & + & 2z & = & -1 \end{array}$$

18. A family takes a 10 mile canoe trip down a river in  $1\frac{1}{4}$  hours. After lunch, it takes them 4 hours to return. Find the rate of the current and rate that the family can row in still water.  
4 pts
19. A charity fundraiser consisted of a spaghetti supper where a total of 387 people were fed. They charged \$6.80 for adults and half-price for children. If they took in \$2444.60, find how many adults and children attended the supper. 4 pts

20. Perform the indicated operation:

3 pts each

a)  $\frac{3}{x+3} - \frac{5}{x^2-9} + \frac{2}{x-3}$

b)  $\frac{4x-8}{3x^2-x} \cdot \frac{(x+2)^2}{4-x^2}$

c)  $\frac{36n^2-64}{3n^2-10n+8} \div \frac{3n^2-8n-16}{n^2-4}$

21. Simplify the complex fraction completely:  $\frac{\frac{2}{x} + \frac{x}{2}}{\frac{2}{x} - \frac{x}{2}}$

4 pts

22. Solve the rational equation:  $\frac{3}{t-1} - \frac{2}{t+3} = \frac{5-6t}{t^2+2t-3}$  Be sure to check all "solutions".

4 pts

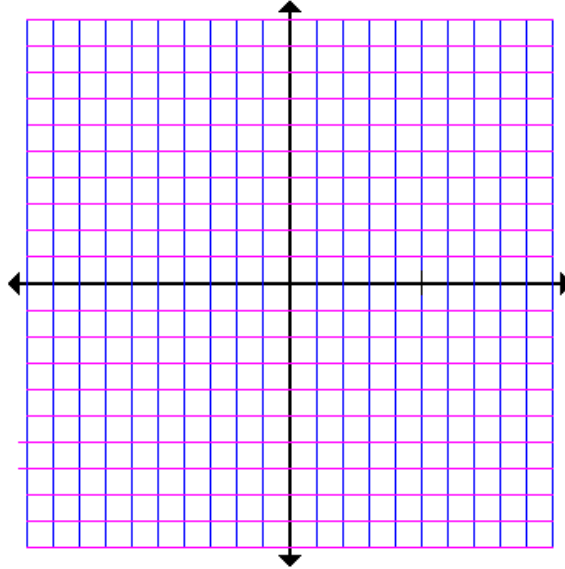
23. In 2 minutes, a conveyor belt moves 300 pounds of aluminum from a delivery truck to a storage area. If the belt works together with a smaller belt and together they complete the job in  $1\frac{1}{2}$  minutes, find how long it would take the smaller belt to do the job on its own?

4 pts

24. Graph the solutions of the system of linear inequalities:

4 pts

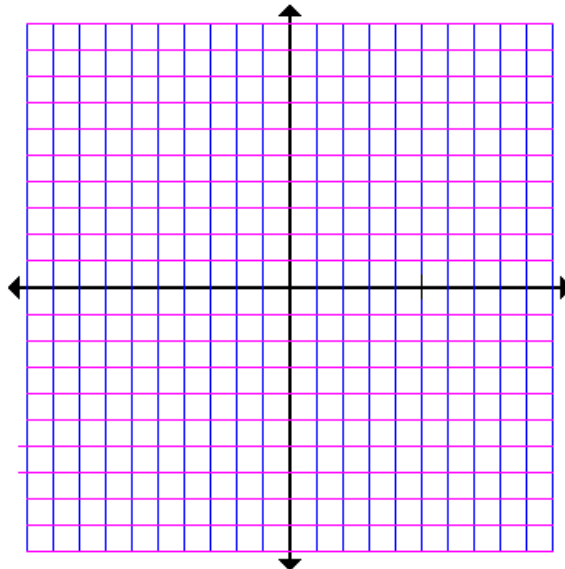
$$\begin{cases} y + 2x \geq 0 \\ 5x - 3y \leq 12 \\ y \leq 2 \end{cases}$$



25. Let  $f(x) = -\sqrt{x-5} + 1$   
List the transformations being applied and graph  $f(x)$ .

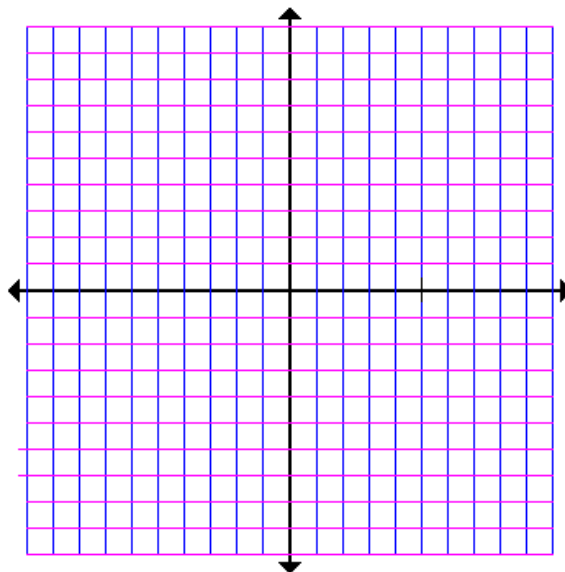
4 pts

Transformations:



26. Graph the function:  $f(x) = \begin{cases} 4x & x > -1 \\ 3x + 1 & x \leq -1 \end{cases}$

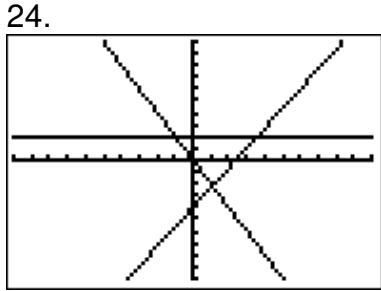
4 pts



Answers:

- 1. e
- 2. b
- 3. a
- 4. c
- 5. a
- 6. b
- 7. a
- 8. d
- 9.  $\frac{1}{2}, \frac{9}{4}$
- 10.  $[-\frac{2}{5}, \frac{6}{5}]$
- 11.  $(-\infty, -2) \cup (5, \infty)$
- 12a. no solution    12b. no solution    12c.  $(-\infty, \infty)$     12d.  $(-\infty, \frac{5}{4}) \cup (\frac{5}{4}, \infty)$
- 13a. -2    13b.  $-2a - h + 2$
- 14a. There are 44.9 million subscribers in 1997
- 14b. The number of subscribers increases by 17.7 million per year after 1997.
- 14c. 275 million subscribers
- 15a. no solution    15b.  $\{(x, y) : x - 8y = 4\}$
- 16. (2,-1,0)
- 17. (1,-4,3)
- 18. Row = 5.25 mph, Current = 2.75 mph
- 19. Adults = 332, Children = 55
- 20a.  $\frac{5x-8}{x^2-9}$     20b.  $-\frac{4(x+2)}{x(3x-1)}$     20c.  $\frac{4(n+2)}{(n-4)}$

- 21.  $\frac{4+x^2}{4-x^2}$
- 22.  $-\frac{6}{7}$
- 23. 6 minutes



shade inside triangle

25. Reflection over x-axis, Right 5, Up 1

