Math 1301 - Test 1 - Spring 2008 1 p.m.

Name:_____ **Student ID:**_____

You may use your calculator. If you want a sheet of scratch paper, it must be visible at the beginning of the test and turned it at the end of the test (however, please note that it will not be graded). No notes or books. You must also make a reasonable effort to shield your test (and scratch paper if you use some) from other student's view.

1. (5 Pts) Circle the correct answer for each of the following statements.

True False **1a.** If $f(1) = 2$, then the graph of the function f contains the point $(1, 2)$.

True False **1b.** If the graph of a function f contains the point $(2, 5)$, then the number 5 is in the domain of f.

True False **1c.** The formula of the horizontal line that contains the point $(3, 4)$ is $y = 4$.

True False **1d.** The graph of a function $f(x) = -4x + 9$ has the point $(0, 9)$ as its y-intercept.

True False **1e.** The graph of a function $f(x) = -4x + 9$ has the point $(\frac{9}{4}, 0)$ as its x-intercept.

2. (6 Pts)Circle all correct answers. Classify each number as one or more of the following: natural number, integer, rational number, or real number.

2a. $\sqrt{5}$: (i) natural number (ii) integer (iii) rational number (iv) real number

2b. $-\frac{16}{4}$: (i) natural number (ii) integer (iii) rational number (iv) real number

2b. $\frac{7}{11}$: (i) natural number (ii) integer (iii) rational number (iv) real number

3. (5 Pts) Consider the following relation. $\{(-7, -10), (-15, 25), (15, 30), (-10, -10)\}$

3a. Write the domain of the relation. $\{-7, -15, 15, -10\}$

3b. Write the range of the relation. $\{-10, 25, 30\}$

3c. Is this relation a function? ☑ Yes ☐ No

Carefully explain your answer.

Every input corresponds to exactly one output.

4. (3 points) The table lists the average U.S. consumption in gallons of alcohol per person from 1940 to 1994. What is the percent change in the U.S. consumption of alcohol from 1940 to 1970?

year	1940	1950	1960	1970	1980	1990	1994
alcohol (in gallons)	1.56	2.04	2.07	2.52	2.76	2.46	2.21

Multiple Choice

(a) 96% **(b)** 3.2% **(c)** 0.96% **(d)** 61.54%

$$\%\text{change} = \frac{2.52 - 1.56}{1.56} \times 100 = 61.538$$

5. For each relation shown below (in part a and in part b), determine if it represents a function.

5a. S is given by the table.

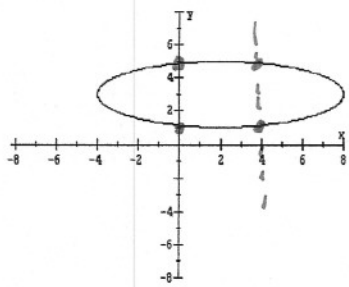
x	-4	-1.5	0	1	0
y	-2	0	-1	1	2

(1 point) Does the table represent a function ☐ Yes ☑ No

(2 points) *Carefully* explain why you chose your answer.

the input 0 corresponds to two outputs namely -1 and 2.

5b.



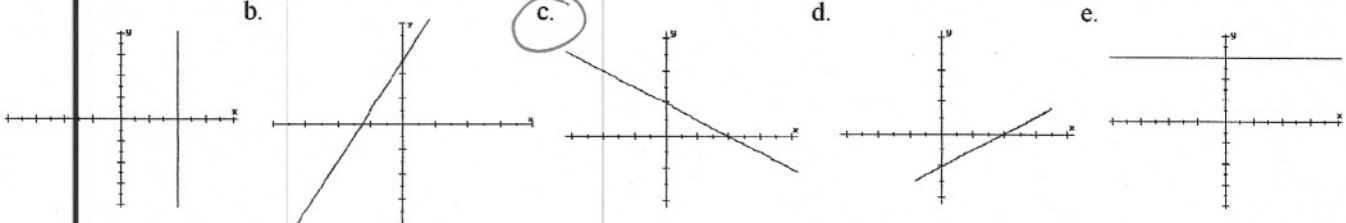
(1 point) Does the graph represent a function ☐ Yes ☑ No

(2 points) *Carefully* explain why you chose your answer.

the input 0 corresponds to two outputs namely to 1 and 5.

6. (2 Pts) Multiple Choice. Circle the correct answer. Which of the lines graphed here has *negative* slope?

a. b. c. d. e.



7. (8 Pts) Answer parts a-e for the function $f(x) = 4$.

7a. True or False: The number 0 is in the domain of this function.

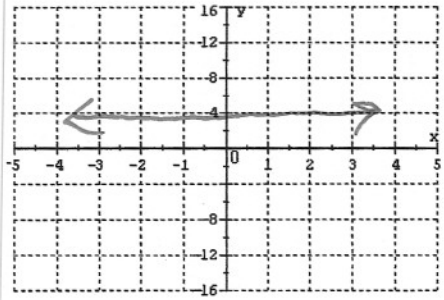
7b. True or False: The number 0 is in the range of this function.

7c. Evaluate

(i) $f(-7) =$ 4 (ii) $f(0) =$ 4 (iii) $f(3) =$ 4

7d. Fill in the blank: f is called a constant function.

7e. Graph the function f on the set of axes shown here.



8. (8 Pts) Let $f(x) = 2x^2 - 1$, use this function to answer parts a-d.

8a. Give an English sentence description for the rule of this function **without** using the word x and **without** using the words substitute and plug-in. Given an input, the output for this function is determined by squaring the input multiplying that by 2 and then subtracting one.

8b. Evaluate: $f(3) =$ 17

$2 \cdot 3^2 - 1 = 2 \cdot 9 - 1 = 17$

8c. Evaluate: $f(w) =$ $2w^2 - 1$

8d. Find and simplify: $f(x-2) =$ $2(x-2)^2 - 1 = 2(x^2 - 4x + 4) - 1$

$= 2x^2 - 8x + 8 - 1$

$= 2x^2 - 8x + 7$

8d. Find and simplify: $f(x+h) =$ $2(x+h)^2 - 1 = 2(x^2 + 2xh + h^2) - 1$

$= 2x^2 + 4xh + 2h^2 - 1$

9. (9 Pts) Find the domain of each of the following functions.

9a. Let $f(x) = \frac{1}{2x-6}$.

i. Evaluate $f(4) =$ 1/2

$f(4) = \frac{1}{2\cdot 4-6} = \frac{1}{8-6} = \frac{1}{2}$

ii. Find the domain all reals except 3 $\{x \mid x \neq 3\}$

all except when $2x-6=0$, $2x=6$, $x=3$

9b. $f(x) = \sqrt{3x-6}$

i. Evaluate $f(4) = \sqrt{6}$

$f(4) = \sqrt{12-6} = \sqrt{6}$

ii. Find the domain $\{x \mid x \geq 2\}$

all reals except when $3x-6$ is negative

so find x such that $3x-6 \geq 0$, $3x \geq 6$, $x \geq 2$

9c. $f(x) = \frac{\sqrt{3x-6}}{2x-6}$

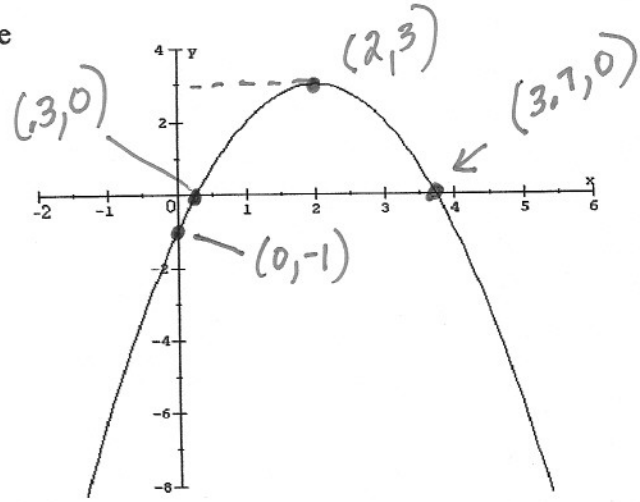
i. Evaluate $f(4) = \frac{\sqrt{6}}{2}$

$f(4) = \frac{\sqrt{3\cdot 4-6}}{2\cdot 4-6} = \frac{\sqrt{6}}{2}$

ii. Find the domain all real numbers greater than or equal to 2 except 3.

note: use parts a & b.

10. (7 Pts) Use the graph of the function g shown here to answer the following questions (in parts a-e).



10a. Evaluate: $g(0) =$ −1

10b. Evaluate: $g(2) =$ 3

10c. Find all values of x such that $g(x) = 0$.

0.3 and 3.7

10d. What is the domain of the function g?

all real numbers

10e. What is the range of the function g?

$\{y \mid y \leq 3\}$

11. (5 Pts) Fill in the blanks.

11a. In general a linear function can be written in the form $f(x) = \underline{m}\,x + \underline{b}$.

11b. The function $f(x) = 5 - \frac{4}{3}x$ has y-intercept $= \underline{5}$.

$= -\frac{4}{3}x + 5$

11c. The function $f(x) = 5 - \frac{4}{3}x$ has slope $= \underline{-4/3}$

11c. Let $f(x) = 5 - \frac{4}{3}x$. Evaluate $f(3) = \underline{1}$

$f(3) = 5 - \frac{4}{3} \cdot 3 = 5 - 4 = 1$

12. (i) For each table, determine whether the data are linear or nonlinear without graphing.

12a. (3 Pts)

x	-3	0	3	6	9
y	4	8	12	16	20

$0-(-3)$, $3-0$, $6-3$, $9-6$ ← changes by 3

$8-4$, $12-8$, $16-12$, $20-16$ ← changes by 4

Is the data linear? ☑ Yes ☐ No

Carefully explain your answer.

The rate of change (of outputs compared to inputs) is constant, namely if is $\frac{4}{3}$.

12b. (3 Pts)

x	0	7	14	21	28
y	-5	-2	1	4	7

7, 7, 7, 7

3, 3, 3, 3

$1-(-2)=3$

$-2-(-5)=-2+5$

Is the data linear? ☑ Yes ☐ No

Carefully explain your answer.

The rate of change is constant, namely if is $\frac{3}{7}$.

13. (4 Pts) Write a *formula in function notation* for a linear function f that models the data exactly.

x	0	1	2	3	4
y	-7	-4	-1	2	5

1, 1, 1, 1

3, 3

y-intercept

slope $= \frac{3}{1} = 3$

$f(x) = 3x - 7$

14. (8 Pts) Suppose the function f outputs the monthly electric bill in dollars for using x kilowatt-hours is given

by $f(x) = 0.06x + 6.50$.

14a. What is the symbol for the input of this function? x

14b. What quantity does the input represent in this function? # Kw-hours

14c. What is the symbol for the output of this function? $f(x)$

14d. What quantity does the output represent in this function? monthly electric bill

14e. Interpret (i.e. write a sentence to give the practical meaning of the statement) $f(1500) = 96.50$.

The monthly electric bill is \$96.50 when 1500 Kw-hours are used.

14f. Interpret (i.e. write a sentence to give the practical meaning of) the slope of f.

$\frac{\text{change in \$}}{\text{change in Kw}}$ | The monthly bill increases by 6¢ for each Kw-hour used.

15. (6 Pts) In 1990, the life expectancy of females was 78.8 years. In 1995, it was 79.6 years. Let E represent the life expectancy in t years since 1990.

a. The rate of change of the life expectancy of females from 1990 to 1995 is

$\text{rate of change} = \frac{79.6 - 78.8}{1995 - 1990}$

0.16

b. The linear function that fits the data is $E(t) =$ $0.16t + 78.8$

slope 0.16 (computed above)
initial value is 78.8

c. Use your function in part b to predict the life expectancy of females in the year 2000.

The year 2000 is 10 yrs after 1990

So, $E(10) = 0.16(10) + 78.8 =$ 80.4 yrs.

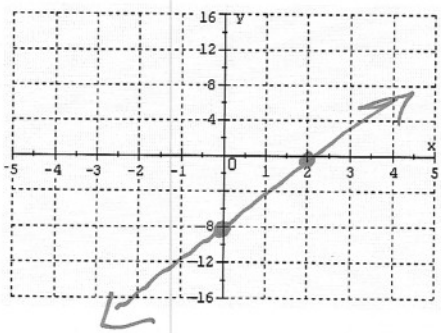
16. (7 Pts) Consider the line with the formula $y = f(x) = 4x - 8$.

16a. Tabulate the function $f(x) = 4x - 8$

$f(0) = 4 \cdot 0 - 8$

x	0	1	2	3	4
y	-8	-4	0	4	8

16b. Graph the function $f(x) = 4x - 8$



17. (3 Pts) Find an equation for the line that has slope $-2/5$ and passes through the point $(0, -4)$.

m b

$y = -\frac{2}{5}x - 4$

18. (2 Pts) Give an example of a formula for a function that is **not linear** $y = f(x) =$ x^2.

19. (2 Pts) Intermediate Algebra question. Solve the equation $x^2 - 3x - 4 = 0$.

$(x-4)(x+1) = 0$

$x = 4$ or $x = -1$