Math 1301 - Test #1 Sample **Name:** Answer Sheet

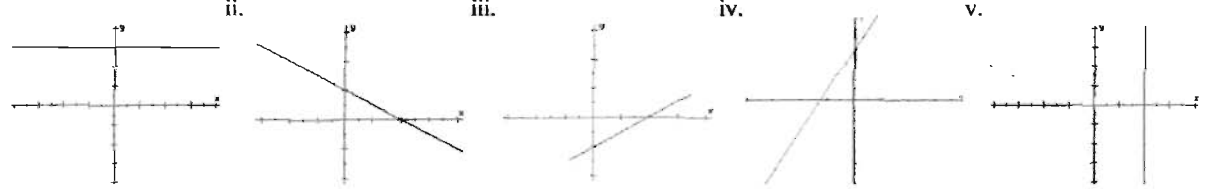
Date: [redacted] **Student ID:**_____

You may find the following formulas helpful to answer some of the sample questions.

$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ *percent change* $= \frac{c_2 - c_1}{c_1} \times 100\%$ $\quad$ $y = mx + b$

1. Use the following lines to answer problems 1a - 1d.

i. ii. iii. iv. v.



1a. Which lines have positive slope? iii, iv

1b. Which lines have negative slope? ii

1c. Which lines have zero slope? i

1d. Which lines have undefined slope? v

2. In problems 2a - 2d, classify each number. Circle all correct answers.

2a. $\sqrt{7}$: (i) natural number (ii) integer (iii) rational number (iv) real number

2b. -3 : (i) natural number (ii) integer (iii) rational number (iv) real number

2c. 4.55 : (i) natural number (ii) integer (iii) rational number (iv) real number

2d. $\sqrt[3]{8}$: (i) natural number (ii) integer (iii) rational number (iv) real number

$= 2$

3. Circle the correct answer in problems 3a and 3b. For each measured quantity, state the set of numbers that is most appropriate to describe it. (There is one correct answer for each problem.)

3a. Attendance at a basketball game: (i) natural number (ii) integer (iii) rational number (iv) real number

3b. Price of a cup of coffee:

(i) natural number (ii) integer (iii) rational number (iv) real number

4. Rewrite each real number using exponents.

4a. $\sqrt{20} =$ $20^{1/2}$

4b. $\sqrt[4]{5^3} =$ $5^{3/4}$

5. Rewrite the real number without using negative exponents or decimals:

$7^{-3} =$ $1/7^3$

6. Rewrite the real number without using fractions or decimals:

$\frac{1}{9^2} =$ 9^{-2}

7. Fill in the blanks: If $f(2) = -10$, then the point (2 , -10) lies on the graph of f.

8. Use the following table to answer problems 8a - 8d. This table shows the number of millions of acres of Texas cropland (y), from 1966 to 2006.

x (elapsed years from 1950)	16	26	36	46	56
y (in millions of acres)	146	139	133	132	128

8a. How much cropland was there in 1986? 133,000,000 acres

8b. What was the minimum amount cropland during this time period? 128,000,000 acres The maximum? 146,000,000 acres

8c. Choose an appropriate viewing window for a scatter plot of this data. Answers may vary.

[0 , 60 , 10] by [120 , 150 , 5] Answers may vary.

8d. Find the percent change in Texas cropland from 1966 to 2006. Interpret your answer.

percent change $= \frac{128-146}{146} \times 100\% = \frac{-18}{146} \times 100\% \approx -12.3\%$

The amount of Texas cropland decreased by 12.3% from 1966 to 2006.

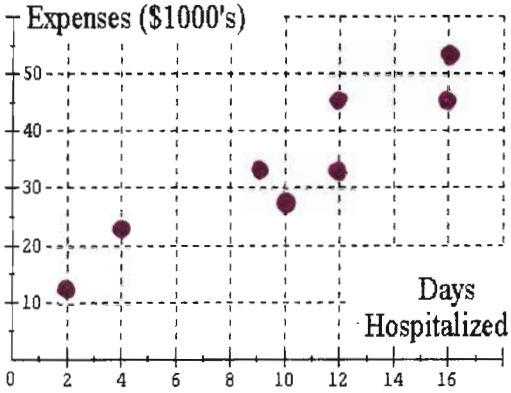
9. An actuary set up the following table for an insurance company that relates the expenses (in thousands of dollars) for hospital patients and the number of days of hospitalization. For this study, the actuary randomly chose the records of 8 patients, each of whom was hospitalized for the same medical procedure.

Number of days hospitalized	2	4	9	10	12	12	16	16
Expenses (in \$1000*'s)*	11	23	33	28	46	32	53	45

9a. Does this table represent a function? Yes ☐ No ☑

9b. What is the graphing window shown at the right?
[0 , 16 , 2] by [0 , 50 , 10]

9c. Make a scatter plot of this table on the set of axes shown at the right.



10. On average, the size S of a child's vocabulary, measured in thousands of words, is a function of his or her age x.

10a. Express the following information in function notation: A 3-year-old has an average vocabulary of 2,500 words. $S(3) = 2.5$

10b. What is the practical meaning of the expression $S(10) = 34.3$?

On average, a 10-year-old has a vocabulary of 34,300 words.

11. Use the function $f(x)$ to answer problems 11a - 11b: $f(x) = \dfrac{3}{2x+1}$. Show your work.

11a. Evaluate $f(-1)$. If not possible, write undefined.

$f(-1) = \dfrac{3}{2(-1)+1} = \dfrac{3}{-2+1} = \dfrac{3}{-1} = -3$

11b. Write the domain of the function f. all real numbers except $-1/2$

$2x+1=0 \rightarrow 2x=-1 \rightarrow x=-1/2$

12. Use the function $f(x)$ to answer problems 12a - 12b: $f(x) = \sqrt{x-5}$. Show your work.

12a. Evaluate $f(1)$. If not possible, write undefined.

$f(1) = \sqrt{1-5} = \sqrt{-4} \rightarrow$ undefined

12b. Write the domain of the function f. all real numbers greater than or equal 5

$x-5 \geq 0 \rightarrow x \geq 5$

13. Use the function $f(x)$ to answer problems 13a - 13b: $f(x) = \dfrac{3}{(x-2)(x+3)}$. Show your work.

13a. Evaluate $f(2)$. If not possible, write undefined.

$f(2) = \dfrac{3}{(2-2)(2+3)} = \dfrac{3}{(0)(5)} = \dfrac{3}{0} \rightarrow$ undefined

13b. Write the domain of the function f. all real numbers except 2 and -3

$(x-2)(x+3)=0$

$x-2=0$ or $x+3=0$

$x=2$ $\quad x=-3$

14. Use the function $f(x)$ to answer problems 14a - 14b: $f(x) = 3x^2 - 1$. Show your work.

14a. Evaluate and simplify: $f(x-h)$

$f(x-h) = 3(x-h)^2 - 1 = 3(x-h)(x-h) - 1 = 3(x^2 - hx - hx + h^2) - 1$

$= 3x^2 - 3hx - 3hx + 3h^2 - 1$

$= 3x^2 - 6hx + 3h^2 - 1$

14b. Write the domain of the function f. all real numbers

15. A car that is currently 50 miles from Houston is traveling on the freeway away from the city at a speed of 70 miles per hour. Let y be the car's distance from Houston after x hours. Write a formula for this function.

$y =$ $70x + 50$

16. A particular laptop computer that costs \$2,000 new is projected to lose \$100 in resale value each month. Let V be the resale value after t months. Write a formula for this function.

$V =$ $2000 - 100t$

17. Consider the following function.

x	-5	-4	-3	-2	-1
y	8	5	4	2	1

Without graphing, is this function linear? ☐ Yes ☑ No

Explain your answer.

There is not a steady change in y as x increases by a steady amount.

If it is linear, find the slope. slope = ☐

18. The following table shows the number of restrooms y required at a worksite that employs x persons.

x	50	150	250	350	450
y	2	4	6	8	10

Without graphing, is this function linear? ☑ Yes ☐ No

Explain your answer.

There is a steady change in y as x increases by a steady amount.

If it is linear, find the slope. slope = ☐

19. Consider the following function: $y = 2x^2 + 8$

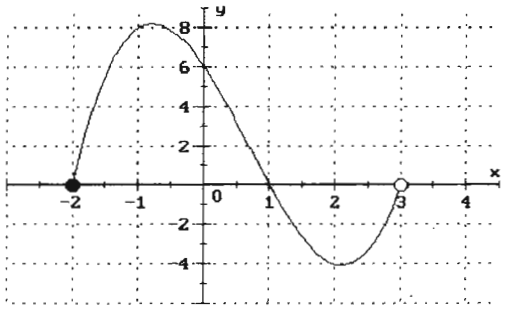
Without graphing, is this function linear? ☐ Yes ☑ No

Explain your answer.

The input variable x is squared.

If it is linear, find the slope. slope = ☐

20. Use the graph of the function g shown here to answer the following questions 20a - 20c.



20a. Evaluate: $g(-1) =$ 8

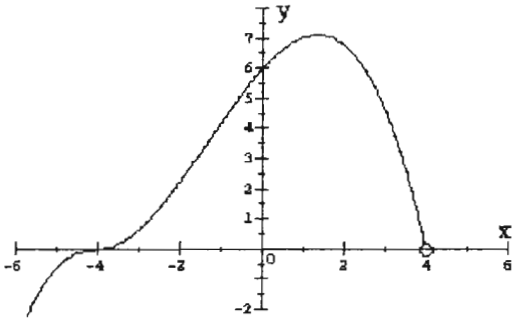
20b. Find all values of x such that $g(x) = 0$.

-2, 1

20c. Write the domain of the function g.

[-2, 3)

21. Use the graph of the function p shown here to answer the following questions 21a - 21c.



21a. Evaluate: $p(4) =$ undefined

21b. Find all values of x such that $p(x) = 6$.

0, 2.5

21c. Write the range of the function p.

$(-\infty, 7]$

22a. Find the slope of the line containing the points $(-3, -2)$ and $(7, 4)$. Show your work.

slope = 3/5

$$m = \frac{4-(-2)}{7-(-3)} = \frac{4+2}{7+3} = \frac{6}{10} = \frac{3}{5}$$

23. Find the slope of the line containing the points $(-3, -2)$ and $(-3, 4)$. Show your work.

slope = undefined

$$m = \frac{4-(-2)}{-3-(-3)} = \frac{4+2}{-3+3} = \frac{6}{0}$$

24. For each relation given in 24a - 24b, determine if it is a function. Check the correct answer and justify.

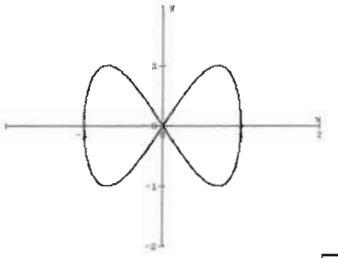
24a. $S = \{(2,1), (1,3), (3,6), (-2,0)\}$

Is this relation a function? ☑ Yes ☐ No

Explain your answer.

Each input matches exactly one output.

24b.



Is this relation a function? ☐ Yes ☑ No

Explain your answer. Do not use the phrase "vertical line test."

Some inputs match more than one output.

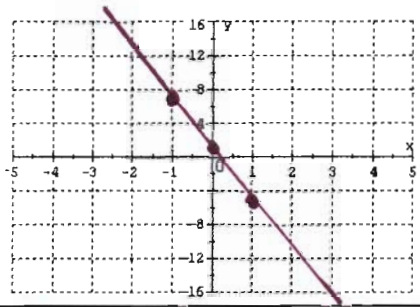
25. In problems 25a - 25b, write the slope and y-intercept of each line.

25a. $f(x) = \frac{2}{3}x - 1$ slope = 2/3 y-intercept = -1

25b. $y = 1 - 6x$ slope = -6 y-intercept = 1

25c. Graph the function $y = 1 - 6x$ on the set of axes shown here.

x	y
0	1
1	-5
-1	7



25d. Write the domain of the function $y = 1 - 6x$. all real numbers

26. Use the function $g(x) = 10$ to evaluate the following expressions:

(i) $g(-2) =$ 10 (ii) $g(2) =$ 10 (iii) $g(a+1) =$ 10

27. Due to urbanization, the deer population in Dry Gulch County has been steadily decreasing since 1970. Scientists have determined the following linear function that relates the number of deer (d) to the elapsed time in years since 1970 (t).

$$d = 13\,000 - 250t$$

27a. What is the practical meaning of the expression $d(10)$? Do not evaluate.

The deer population in 1980.

27b. Express the following information in function notation: The deer population is projected to be 3,000 in 2010.

d(40) = 3000

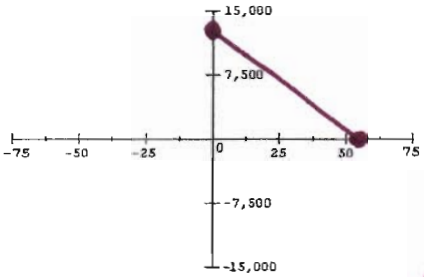
27c. What is the y-intercept of this function? y-int. = 13000 Interpret this value in the context of the problem.

The deer population in 1970 was 13000.

27d. What is the slope of this function? slope = $\boxed{-250}$ Interpret this value in the context of the problem.

The deer population is decreasing by 250 per year.

27e. Sketch a graph of the function d on the set of axes shown here. Be sure your graph indicates the correct domain.



t	d
0	13000
52	0

$0 = 13000 - 250t$

$-13000 = -250t$

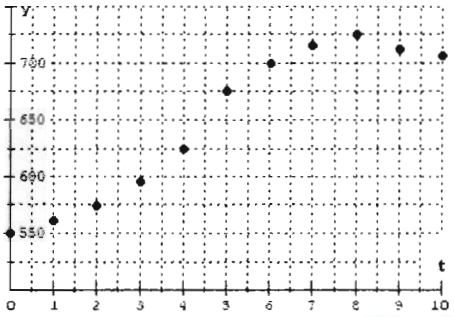
$52 = t$

28. The following table shows the typical age at first marriage for females in the U.S., from 1950 to 2000. What is the y-intercept of this function?

x (elapsed years from 1950)	0	10	20	30	40	50
y (age)	20.3	20.3	20.8	22.0	23.9	25.1

y-intercept = $\boxed{20.3}$

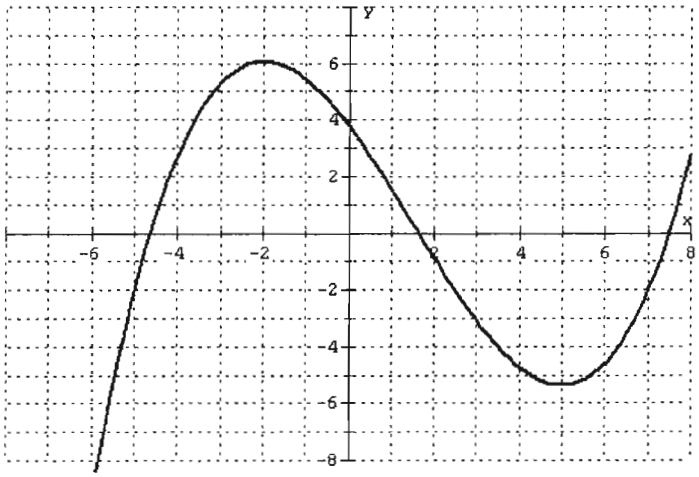
29. The following scatter plot shows the average monthly apartment rent y in Houston, t elapsed years after 2000.



29a. What was the average monthly apartment rent in 2004? $625

29b. When was the average monthly apartment rent $725? 2008

30. Use interval notation to indicate where the function f shown here is increasing, decreasing, or constant.

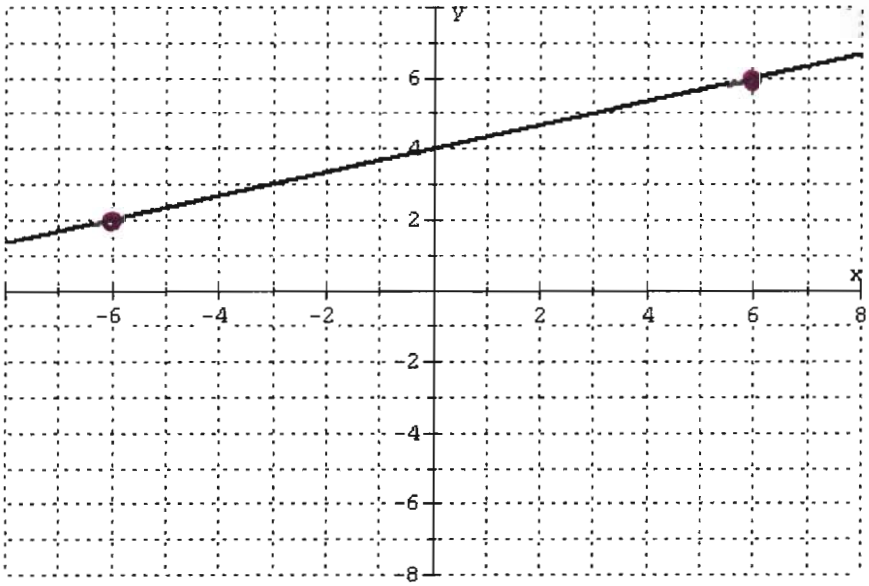


Increasing: $(-\infty, -2] \cup [5, \infty)$

Decreasing: $[-2, 5]$

Constant:

31. Find the formula of the line shown here. Show your work. $y =$ $mx + b = \frac{1}{3}x + 4$



$b = 4$

(6,6), (-6,2)

$m = \frac{2-6}{-6-6}$

$= \frac{-4}{-12} = \frac{1}{3}$

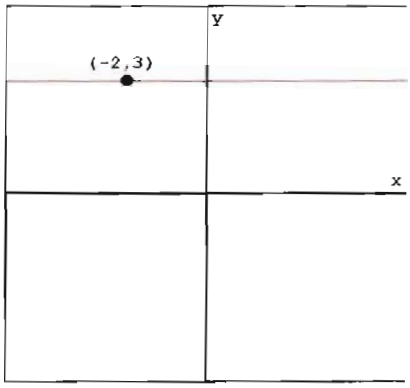
32. The percentage y of doctorates in math in the U.S. earned by women can be approximately modeled by the following linear function, where x is the elapsed number of years after 1960.

$$y = 0.6x + 3$$

Find the slope of this line and interpret its meaning in a practical context. $m = 0.6$

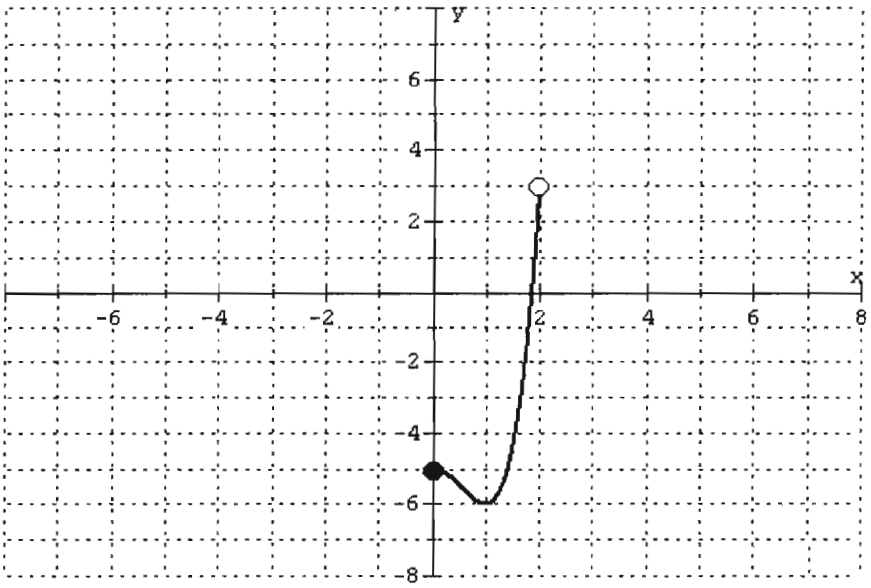
The percentage of doctorates in math in the U.S. earned by woman is increasing by 0.6% each year.

33. Find the formula for the line shown here. Show your work. $y =$ mx+b =0x+3 = 3



m=0
b=3

34. Write the domain and range of the function graphed here using interval notation.



domain = [0, 2)

range = [-6, 3)