Practice Final **MATH 1050 FINAL EXAM** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Recitation Instructor/Time\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**PART I: MULTIPLE CHOICE.** Each problem has only **one correct answer.** Each problem is worth **7 points**. ***PLEASE PLACE YOUR ANSWER IN THE SPACE PROVIDED.***

\_\_\_\_1. Which interval represents the solution of the **rational inequality**:

(a) (b) (c) (d) (e)

\_\_\_\_2. . Using interval notation, specify the **domain** of the function:

(a) (b) (c) (d) (e)

\_\_\_\_3. Starting with the function , you want to transform the graph of by first reflecting the graph across the **y-axis**, and then shifting the graph **vertically** upward 30 units. Which of the following functions would be appropriate for the resulting graph?

1. (b) (c) (d) (e)

\_\_\_\_4. Given the functions and , determine the **domain** of the function: :

1. (b) (c) (d) (e)

\_\_\_\_5. Given the functions and , evaluate the following:

1. 9 (b) (c) (d) (e) is not in the domain of the function .

\_\_\_\_6. Which of the following statements is TRUE concerning the rational function ? Choose the most appropriate response.

1. The graph of the function has **only one** vertical asymptote.
2. The graph of the function has a horizontal asymptote given by .
3. The **domain** of the function is given by .
4. As .
5. The graph of the function has a slant asymptote given by .

\_\_\_\_7. The monthly profit, , that a drug company makes from the production and sale of kilograms of a painkiller is given by the **quadratic function**: . Which of the following statements is TRUE concerning this function? Choose the most appropriate response.

1. The maximum monthly profit will be realized if the production level is 300 units.
2. The maximum monthly profit is $300.
3. The monthly profit function does not have a maximum value if the production level is restricted to .
4. The maximum monthly profit is $16,000.
5. If the production level is restricted to , the company’s profit will always be negative.

\_\_\_\_8. is a **zero** of the polynomial function . Which of the following is a **factor** of ?

(a) (b) (c) (d) (e)

\_\_\_\_9. is a **zero** with **multiplicity 2** of the polynomial function . Which of the following statements is TRUE about this function? Choose the most appropriate response.

1. The graph of has 2 -intercepts.
2. is a **linear factor** of .
3. Using only the **real numbers**, can be written as a product of linear factors.
4. is a **linear factor** of .
5. The equation has 3**real** solutions.

\_\_\_\_10. The function is a one-to-one function. Using interval notation, the **range** of is given by:

1. (b) (c) (d) (e)

\_\_\_\_11. The function has an **-intercept** given by which of the following. (All answers are in exact form.)

 (b) (c) (d) (e) The graph has **no -intercept**.

\_\_\_\_12. Solve the equation for : 

1. (b) (c) (d) (e) The equation has no solution.

\_\_\_\_13. The expression may be re-written in an equivalent form as:

1. (b) (c) (d) (e)

\_\_\_\_14. Find all solutions to the equation:

(a) (b) (c) (d) (e) The equation has no solution.

\_\_\_\_15. Solve the equation for :

1. and (b) and (c) (d) and

(e) The equation has no solution.

\_\_\_\_\_16. Using **partial fractions**, the rational expression can be written in an equivalent form as the sum of two rational expressions. Determine the value of the **numerator** of the expression that has as its denominator.

(a) 1 (b) 1 (c) (d) 2

\_\_\_\_17. Given the matrix , consider the following statement: The inverse matrix, , exists.

1. The statement is TRUE (b) The statement is FALSE.

\_\_\_\_18. Consider the following **nonlinear** system of equations: .

In the solution, the **two values for**  are given by:

1. (b) (c) (d)

 (e) The system has no solution.

**PART II: *READ THESE INSTRUCTIONS!!***  Do ***ANY 4*** and ***ONLY 4*** of the 5 problems. **Cross out completely the problem that is NOT to be graded.** **Provide the units on your answers where applicable**. Each problem is worth **18 points**.

***SHOW YOUR WORK*** in a clear and organized format if you expect to receive full or partial credit. ***IDENTIFY YOUR ANSWERS.***

1. The value, , of an investment at a point in time years in the future will be approximated using an exponential growth model: . The initial value of the investment at time is . At time years, the investment has reached a value of ; that is,
2. (12 points) Using the information provided above, determine the value of the **growth constant,** , that would be appropriate for the exponential growth model. Provide the **exact value** and a **3-decimal place** approximation. Then, write the completely specified function .
3. (6 points) Another investor has found a similar investment opportunity that will also grow according to an exponential growth model. She has been informed that the growth constant for her investment is (that is, an annual growth rate of 6.2%). As such, the model to be used for the value of her investment is given: **;** . Her desire is for the investment to have a value of $150,000 at time years from the present. What must the **initial amount** of the investment, be equal to in order to meet this objective? Round your answer to **the nearest dollar**.
4. A rural community has experienced an outbreak of a highly contagious flu virus. The number, , of residents infected with the virus at a point in time days from the present is to be approximated by the logistics growth model: *residents* ; . (Note the exponent in the denominator: **.**5.)
5. (4 points) At the present time (), how many residents are infected with the virus?
6. (10 points) At what point in time will the number of infected residents reach a value of 2500? (Round your answer to **2 decimal places.**)
7. (4 points) In the long-run (that is, mathematically, as ), what value will the number of infected residents approach? (Recall that this is a logistics growth model.)
8. A sheep rancher has been informed by a veterinarian that if there are no unusual diseases affecting his herd, the population size, , of the herd at a time months from the present may be predicted by the model: .
9. (10 points) Determine the inverse function . Write your answer in the form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. (8 points) **In the context of this problem**, explain (in words) what the input to the function represents, and what the output of the function represents. BE SPECIFIC.

INPUT:

OUTPUT:

1. A developing country has to decided to allocate funds for the acquisition of computers in order to increase internet access to students in public schools. Based on funding projections, the **percentage,** , of students with access to the internet at their school at a time years from the present is to be modeled by the **rational** **function**: **%**, .
2. (10 points) According to this function, at what **time** will the percentage of students with internet access be equal to 64%? (Round your answer to **one decimal place**.)
3. (8 points) In the “long run” (mathematically, as ), what value will the percentage of students with internet access approach? That is, complete the following: As \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**YOU MUST JUSTIFY YOUR ANSWER with computations and a mathematically appropriate explanation**.

1. You have been provided with 18,000 feet of fencing and asked to enclose 2 identical rectangular fields along a river (the dashed line). **There will be no fencing required along the side of the rectangles that borders the river.** The width of the rectangles is denoted by.
2. (8 points) Determine **a function**, **,** that expresses the AREA of the **LARGE rectangle** in terms of the **width,**  (that is, the total area of both fields together). NOTE: The formula for the area of a rectangle is .



1. (10 points) **Using your result from part (a)**, determine the **maximum area** that can be enclosed by the **LARGE rectangle** with the 18,000 feet of fencing.

**Descartes’ Rule of Signs**: If is a polynomial function with real coefficients and the constant term is not zero, then: (i) The number of positive real zeros is either equal to the number of variations in sign of , or less than that number by an even integer; (ii) the number of negative real zeros is either equal to the number of variations in sign of , or less than that number by an even integer.

**Complex Conjugate Zeros Theorem**: If a polynomial function has real coefficients, and if is a zero of , then its complex conjugate is also a zero of .

**Quadratic function**: vertex ; , vertex ()

 **Quadratic formula**: ;

 ; ; ; ; ;

; ;

# MATH 1050 FINAL EXAM KEY

## PART I

1. D
2. C
3. B
4. E
5. E
6. B
7. D
8. D
9. D
10. D
11. C
12. D
13. A
14. B
15. C
16. B
17. B
18. B

## PART II

1. (a) (b)

2. (a) (b) (c) As

3. (a) (b) INPUT: A population size; OUTPUT: The **time** at which the population will be this size.

4. (a) (b) The graph of has a **horizontal asymptote** given by

5. (a) (b)

 **MATH 1050 FINAL EXAM TOPICS SPRING 2014**

Part I

1. 0.4 Rational inequalities

2. 1.1 Domain of a function

3. 1.3/3.1 Transformations of graphs of exponential functions

4. 1.5 Inverse functions

5. 1.4 Composition of functions

6. 2.6 Rational functions/asymptotes

7. 2.1 Quadratic functions

8. 2.2-2.5 Polynomial functions

9. 2.2-2.5 Polynomial functions

10. 2.2-2.5 Polynomial functions

11. 3.3/3.4 Log functions and log equations

12. 3.4 Log equations

13. 3.3 Log properties

14. 3.4 Exponential equations

15. 3.4 Exponential equations

16. 8.6 Partial Fractions

17. 8.4 Matrix Algebra/inverse matrix

18. 9.5 Nonlinear system of equations

Part II

1. 3.5 Exponential Growth/Decay models

2. 3.5 Logistics Growth Model

3. 1.5 Inverse functions/application

4. 2.6 Rational functions/application

5. 2.1 Quadratic functions/application

**The following information will be provided**:

**Quadratic function**: vertex ; , vertex ()

**Quadratic formula**:

; ; ; ; ;

; ;

**Descartes’ Rule of Signs**: If is a polynomial function with real coefficients and the constant term is not zero, then: (i) The number of positive real zeros is either equal to the number of variations in sign of , or less than that number by an even integer; (ii) the number of negative real zeros is either equal to the number of variations in sign of , or less than that number by an even integer.

**Complex Conjugate Zeros Theorem**: If a polynomial function has real coefficients, and if is a zero of , then its complex conjugate is also a zero of .

## **MATH 1050 Final Exam Topics SPRING 2014**

0.4 Solving inequalities (1)

* 1. Domain of a function (1)

1.3/3.1 Transformations of graphs of exponential functions (1)

* 1. Composition of functions (1)
	2. Inverse functions/applications (2)
	3. Quadratic functions/ applications (2)

2.2-2.5 Polynomial functions: Zeros, factors and factoring (3)

* 1. Rational functions: asymptotes and applications (2)

3.3-3.4 Properties of logarithms; solving log and exponential equations (5)

3.5 Exponential growth/decay and logistics growth models (2)

8.4 Matrix Algebra (1)

8.6 Partial fraction decomposition (1)

9.5 Nonlinear system of equations (1)