Math 101 Final Exam

May 5, 2016

Name: _____ UNL Student ID Number: _____

Indicate your section/instructor.

☐	Section 001	Dyrud	☐	Section 002	Conner
☐	Section 003	Williams	☐	Section 004	Galvin
☐	Section 005	Gravelle	☐	Section 006	McMorris
☐	Section 007	Hass	☐	Section 008	Gheibi
☐	Section 009	Beemer	☐	Section 010	Drabkin
☐	Section 011	Swaidan	☐	Section 101	Emery
☐	Section 171	Bills			

Question	Points	Score
1	10	
2	10	
3	15	
4	15	
5	15	
6	15	
7	15	
8	15	
9	10	
10	15	
11	15	
Total:	150	

Answer the questions in the spaces provided on the question sheets. Show an appropriate amount of work (including appropriate explanation) for each problem, so that graders can see not only your answer but also how you obtained it. Include units in your answer when possible. You may receive 0 points for a problem where you show no work.

Instructions:

1. Do not open this exam until you are told to do so.
2. No books or notes may be used on the exam.
3. Credit or partial credit will be given only when the appropriate explanation and/or algebra is shown.
4. Make sure your answer is clearly marked.
5. Read and follow directions carefully.
6. This exam has 11 questions, for a total of 150 points. There are 11 pages. Make sure you have them all.
7. You will have 120 minutes to complete the exam.
8. All cell phones and electronic devices (other than calculators) must be turned off during the exam.
9. Do not separate the pages of this exam. If they do become separated, write your name on every page and point this out to your instructor when you hand in the exam.
10. You may only use an *approved* calculator on the exam.
11. If you use graphs or tables to find an answer, be sure to include an explanation and sketch of the graph, and to write out the entries of the table that you use.

1. [10 points] Susie is on a game show. She spins a wheel, and depending on where it lands, she might get a prize. The relationship between the number on which it lands, N, and the prize she receives, P, is given below for three different wheels.

Wheel #1

N	P
1	Teddy bear
2	Doughnuts
3	Chips
4	Nothing
5	Chocolates
6	Poster

Wheel #2

N	P
1	Chips
2	Poster
3	Chips
4	Nothing
5	Chocolates
6	Chocolates
7	Chocolates
8	Teddy bear
9	Nothing
10	Teddy bear

Wheel #3

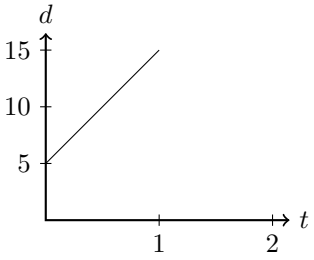
N	P
1	Teddy bear or nothing
2	Chocolates or nothing
3	Poster or nothing

(a) For which wheel(s) is P a function of N?

(b) For which wheel(s) is N a function of P?

2. [10 points] Match each story about a bike ride to one of the graphs below, where d represents distance from home in miles and t is time in hours since the start of the ride. *Note: A graph may be used more than once.*

(i)



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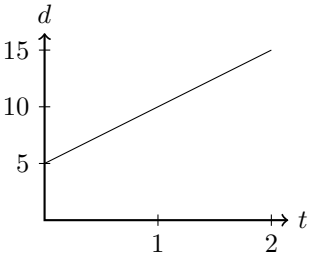
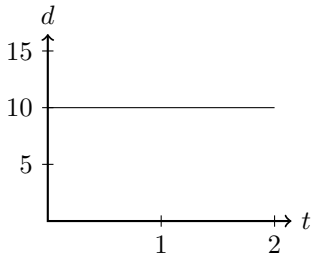
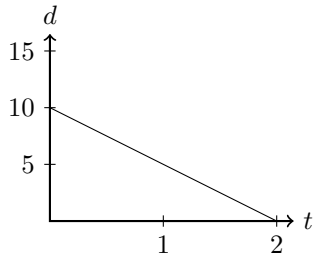


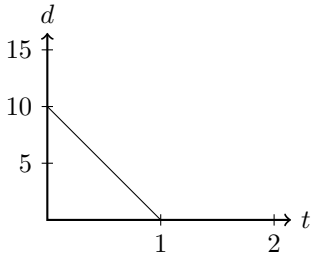
(iii)



(iv)



(v)



(a) You start 5 miles from home and ride 5 miles per hour away from home. _____

(b) You start 5 miles from home and ride 10 miles per hour away from home. _____

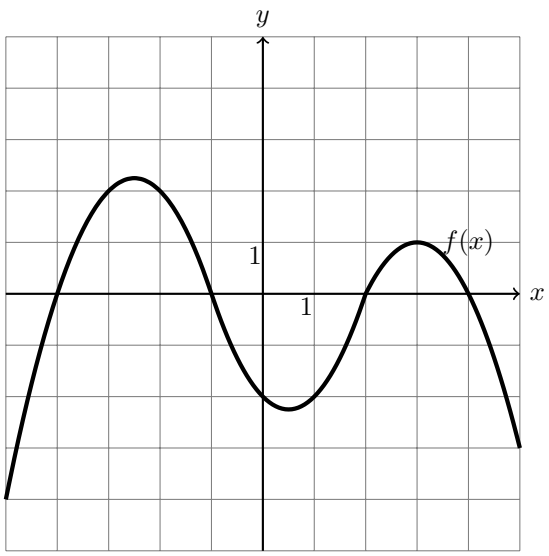
(c) You start 10 miles from home and arrive home one hour later. _____

(d) You start 10 miles from home and are halfway home after one hour. _____

(e) You start 5 miles from home and are 10 miles from home after one hour. _____

3. [15 points] Using the table and graph below, evaluate the following quantities.

x	0	1	2	3
$g(x)$	2	4	1	5



(a) $f(g(2))$

(b) $g(f(3))$

(c) $f(1)g(1)$

(d) $f(g^{-1}(1))$

4. [15 points] Find a possible formula for a polynomial g such that g is fifth degree, g has double zeros at $x = 2$ and $x = -3$, $g(1) = 0$, and $g(0) = 18$.

5. [15 points] The gross domestic product (GDP in billions of dollars) of Chile can be approximated by the formula $G = f(t) = 145.8(1.051)^t$, where t is years since 2007.

   (a) Evaluate and interpret $f(8)$. *Be sure to write your interpretation in complete sentences, being sure to include units.*

   (b) Find a formula for $f^{-1}(G)$ in terms of G.

   (c) Evaluate and interpret $f^{-1}(187)$. Round your answer to the nearest hundredth. *Be sure to write your interpretation in complete sentences, being sure to include units.*

6. [15 points] A Boeing 737 airplane requires $g(x) = 2.5x + 1171$ gallons of fuel to fly x passengers from Denver to Los Angeles. Jet fuel currently costs \$5.21 per gallon plus a fixed \$50 hookup fee. Therefore, the cost in dollars to fill a plane with g gallons of fuel is given by $C(g) = 5.21g + 50$.

   (a) Evaluate and interpret $C(1500)$. *Be sure to write your interpretation in complete sentences including units.*

   (b) Evaluate and interpret $C(g(30))$. *Be sure to write your interpretation in complete sentences including units.*

   (c) How much should the airline expect to pay in fuel costs to fly 80 passengers from Denver to Los Angeles?

   (d) **Bonus Question [5 points]:** The airline is currently running a special and selling tickets for \$50 per ticket. How many tickets does the airline want to sell to make sure they at least cover the fuel costs of the trip?

7. [15 points] The cost of custom printing t-shirts changes depending on how many shirts you print. For orders under 20 shirts the cost is \$15 per shirt. However, for 20 or more shirts the first 19 shirts are billed at \$15 a piece and for each additional shirt the cost drops to \$12 per shirt.

(a) Fill in the following table showing the cost for printing x shirts.

Number of Shirts:	1	5	10	20	40
Cost (in dollars):					

(b) What is the cost for printing 22 shirts?

(c) Complete the piecewise defined function $C(x)$, which gives the cost, in dollars, of printing x shirts.

$$C(x) = \begin{cases} \square, & \text{for } 0 < x < \square \\ \square, & \text{for } \square \leq x \end{cases}$$

8. [15 points] Consider the functions

$$f(x) = \frac{x+3}{(x-1)(x+3)} \qquad \text{and} \qquad g(x) = \frac{x+2}{(x+2)(x+4)}$$

(a) For each of the above functions, determine the long-run behavior, zeros, vertical asymptotes, and holes. If the function does not have any, write "none."

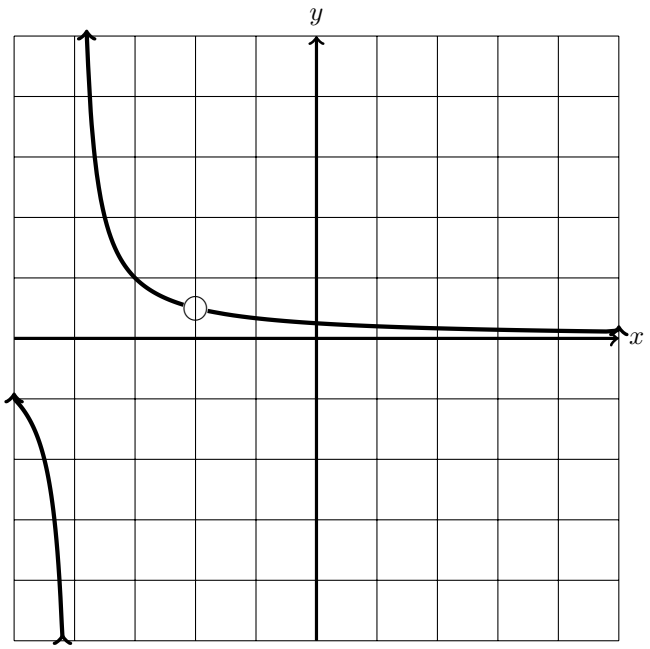
$f(x)$

- Long-run behavior _____
- Zeros _____
- Vertical asymptotes _____
- Holes _____

$g(x)$

- Long-run behavior _____
- Zeros _____
- Vertical asymptotes _____
- Holes _____

(b) Determine which *one* of the above functions matches the given graph.



9. [10 points] Match each equation below to one of the exponential functions in the graph.

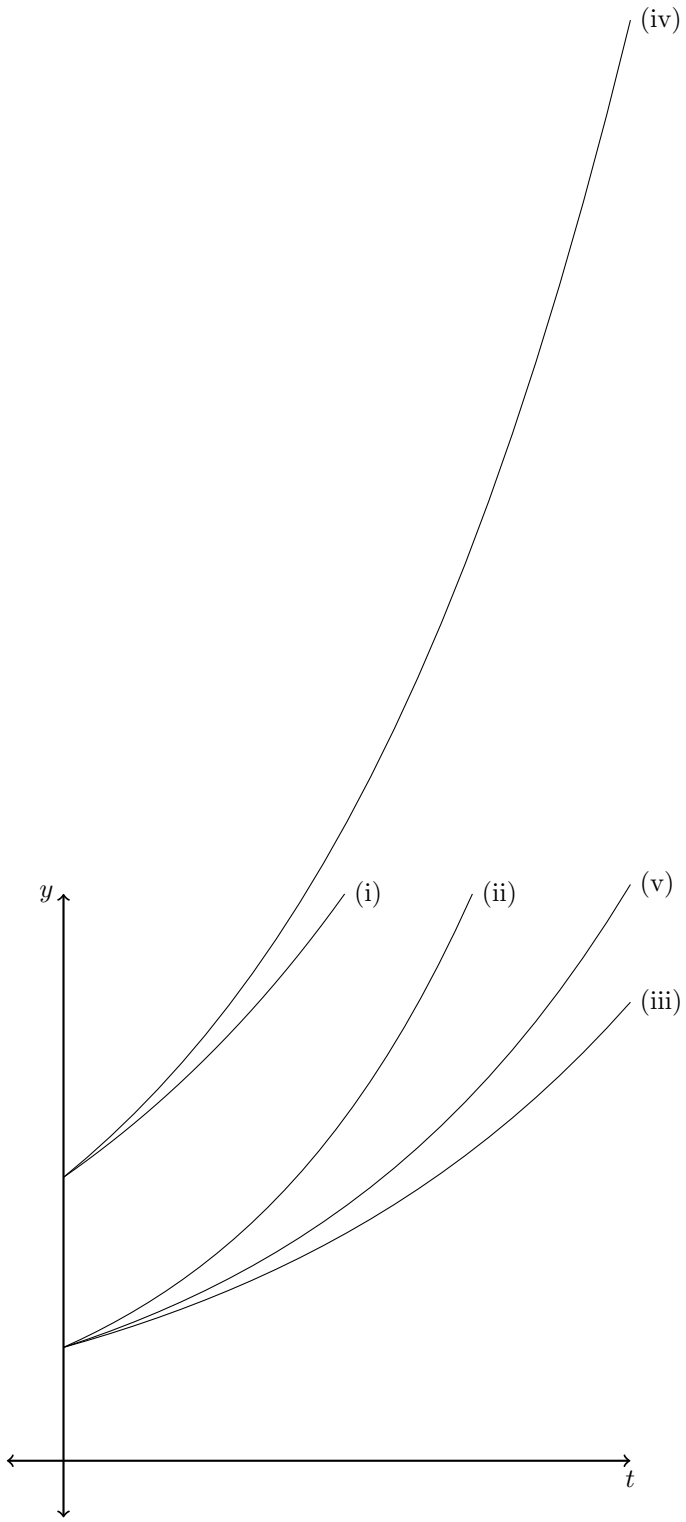
(a) $y = 5(2)^t$ _____

(b) $y = 2(2)^t$ _____

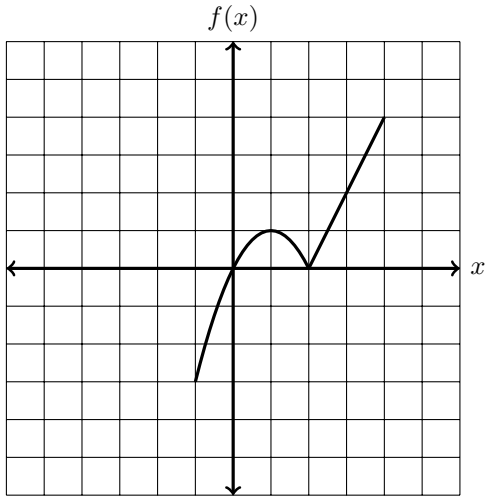
(c) $y = 5(0.5)^t$ _____

(d) $y = 2(0.5)^t$ _____

(e) $y = 2(3)^t$ _____

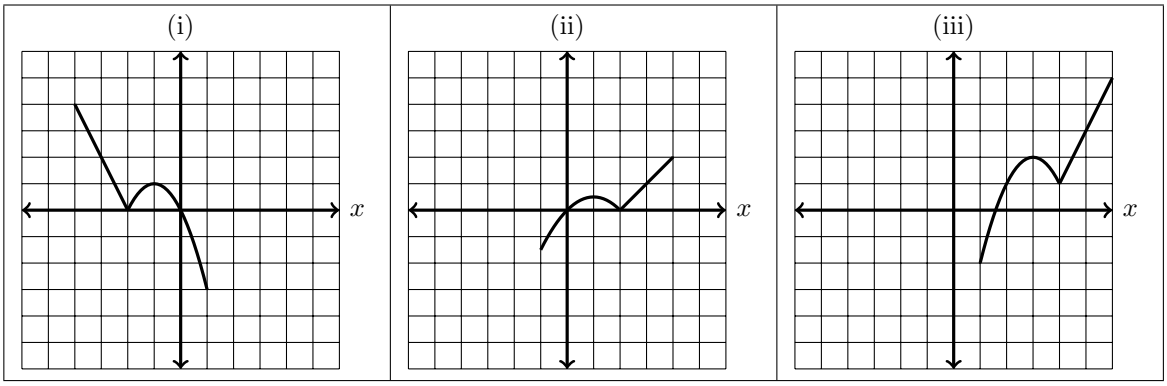

(iv)
(i)
(ii)
(v)
(iii)
y
t

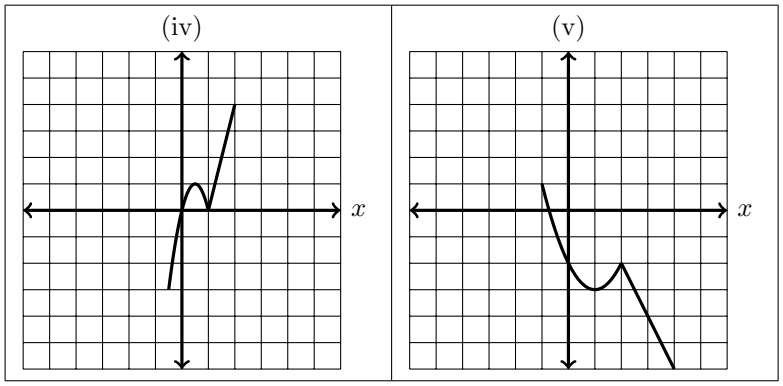
10. [15 points] The graph of $f(x)$ is given below. Match each transformation to one of the graphs given.



(a) $f(x-2)+1$ _____ (c) $f(-x)$ _____ (e) $-f(x)-2$ _____

(b) $f(2x)$ _____ (d) $\frac{1}{2}f(x)$ _____





11. [15 points] A population of zombies is growing quickly. Initially, there were 125 zombies. Six days later, there were 515 zombies.

(a) If the growth is exponential, write an equation $Z(t)$ for the number of zombies t days after the initial outbreak.

(b) Evaluate and interpret $Z(14)$. Round your answer to the nearest whole number. *Be sure to write your interpretation in a complete sentence.*

(c) If the trend continues, when will there be 2,000 zombies? Round your answer to the nearest day after the beginning of the outbreak. *Be sure to write your interpretation in a complete sentence.*