

Math 120 A - Autumn 2016  
Midterm Exam Number Two  
November 17th, 2016

Name: \_\_\_\_\_

Student ID no. : \_\_\_\_\_

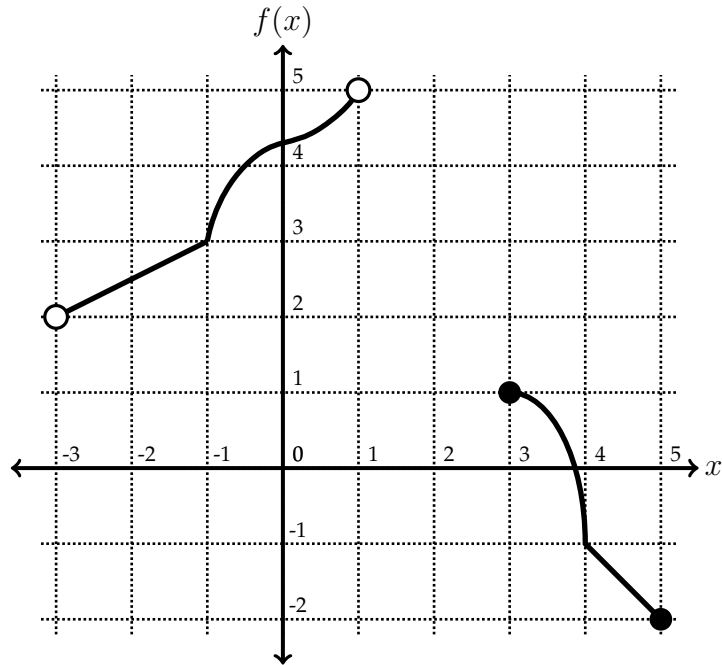
Signature: \_\_\_\_\_

Section: \_\_\_\_\_

1	14	
2	15	
3	15	
4	16	
Total	60	

- This exam consists of FOUR problems on FIVE pages, including this cover sheet.
- Show all work for full credit.
- You may use a TI-30X IIS calculator during this exam. Other calculators and electronic device are not permitted.
- You do not need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- If you write on the back of the page, please indicate that you have done so!
- Draw a box around your final answer to each problem.
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 50 minutes to complete the exam.

1. Happy Thursday! I bought you this graph.



(a) [4 points] Compute  $f(f(f(4)))$ .

(b) [5 points] Find the domain and range of  $f^{-1}(x)$ .

(c) [5 points] Let  $g(x) = f(2x + 1) + 1$ . Find the domain and range of  $g(x)$ .

2. **[15 points]** Gomba is on a diet. His weight is a linear-to-linear rational function of time.

Right now, Gomba weighs 21 pounds.

In 1 month, he will weigh 20.5 pounds.

In 7 months, he will weigh 18.75 pounds.

In the long run, what will Gomba's weight approach?

(Assume Gomba will live forever.)

3. **[5 points per part]** The rent for a one-bedroom apartment in Beattle is growing exponentially. (Even though the city is filled with bees.)

(a) In the year 2000, the rent in Beattle was \$1020, and it increases by 2.3% per year.

Write a function  $f(t)$  for the rent in Beattle  $t$  years after 2000.

(b) The average monthly rent in Tickoma is also growing exponentially.

In the year 2007, the rent in Tickoma was \$500 less than the rent in Beattle.

In the year 2016, the rent in Tickoma is \$1000.

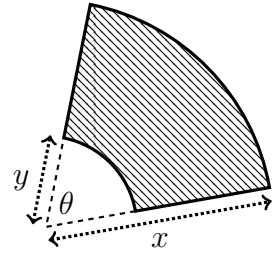
Write a function  $g(t)$  for the rent in Tickoma  $t$  years after 2000.

(c) When will the rents in Beattle and Tickoma be equal?

(Round your answer to the nearest year.)

4. A *polar rectangle* is the region bounded by two concentric circular arcs and two rays through the center of those arcs. Okay, fine, here's a picture:

- (a) [4 points] Write a formula for the *area* of this polar rectangle.  
(Your answer will involve  $x$ ,  $y$ , and  $\theta$ . Let  $\theta$  be measured in radians.)



- (b) [4 points] Write a formula for the *perimeter* of this polar rectangle.

- (c) [8 points] Suppose you have 24 meters of fencing, and you want to construct a fence in the shape of a polar rectangle with central angle  $\theta = 1.2$  radians. What is the maximum possible area of your fence?