

Math 120 A - Spring 2014  
Midterm Exam Number Two  
May 22, 2014

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

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

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

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

1	16	
2	12	
3	10	
4	12	
5	10	
<b>Total</b>	<b>60</b>	

- This exam consists of FIVE problems on SIX pages, including this cover sheet.
- Show all work for full credit.
- You may use a scientific calculator during this exam. Graphing calculators are not permitted. Also, other electronic devices are not allowed, and should be turned off and put away for the duration of the exam.
- 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!
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 50 minutes to complete the exam.

1. **[4 points each]** In each of the following equations, solve for  $x$ . If there are multiple solutions, find all of them.

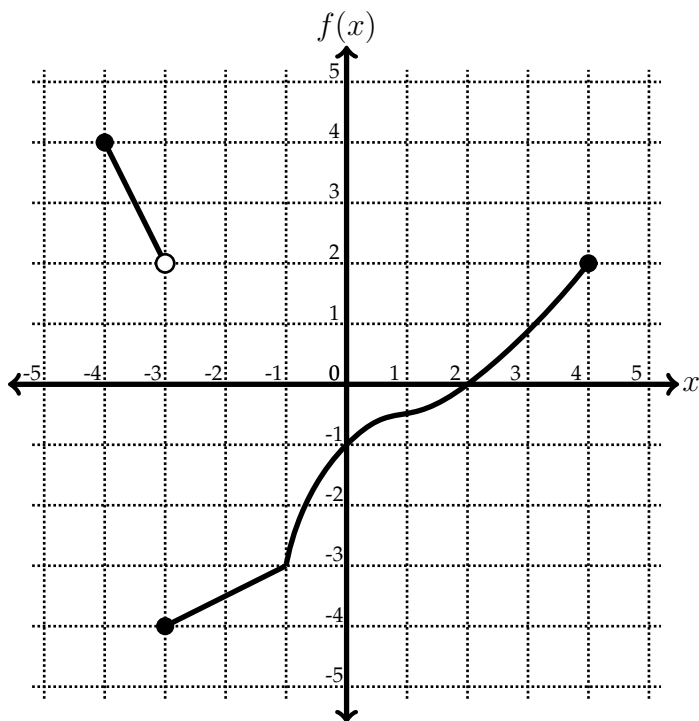
(a)  $x + 3 = \frac{15}{x} + 1$

(b)  $5000 = 2000x^9$

(c)  $e^{5x} = 12$

(d)  $\ln(3x + 2) = 4$

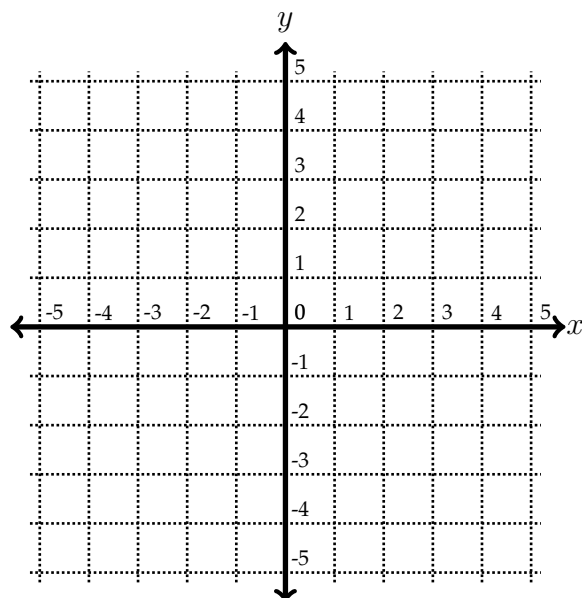
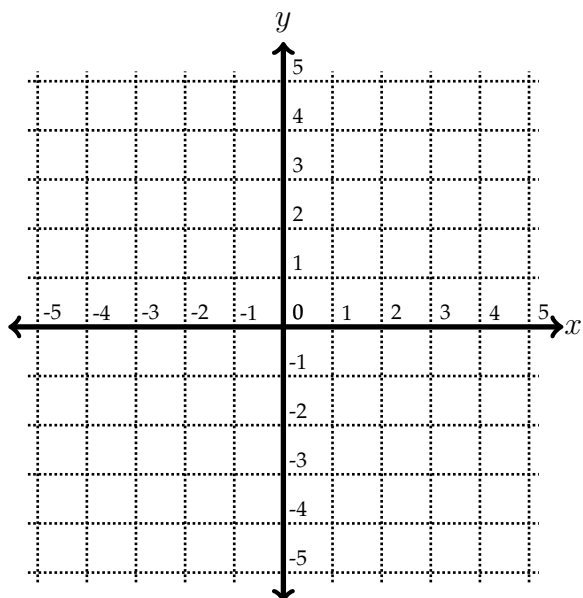
2. [4 points each] Here's the graph of a function  $f(x)$ . Use it to solve parts (a), (b), and (c):



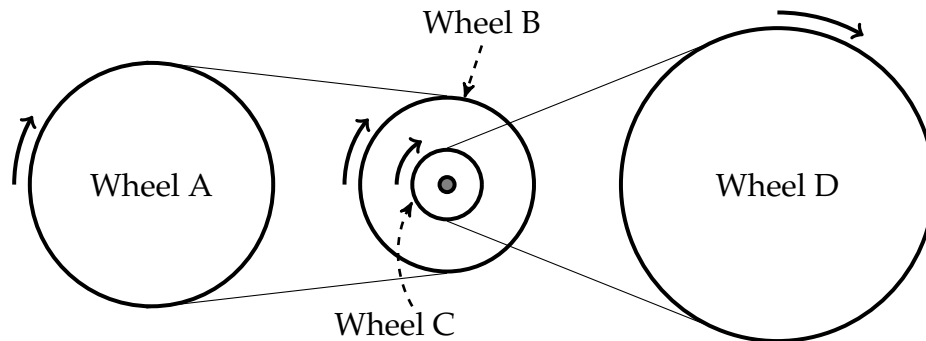
(a) Compute  $f(f(f(2)))$ .

(b) Sketch the graph of  $y = f^{-1}(x)$

(c) Sketch the graph of  $y = f(2x + 1)$



3. [10 points] Four wheels are connected as shown in the diagram below: Wheels A and B are connected by a belt, Wheels B and C are connected by an axle, and Wheels C and D are connected by a belt.



Suppose Wheel A has radius 8 cm, Wheel B has radius 5 cm, Wheel C has radius 2 cm, and Wheel D has radius 9 cm.

If Wheel A makes 3 full rotations per minute, what is the angular speed of Wheel D? Express your answer in radians per second.

4. **[12 points]** A pie is removed from an oven. As it cools, its temperature in Fahrenheit is a linear-to-linear rational function of time.

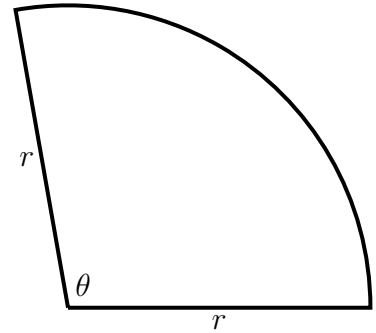
After 3 minutes, the pie is  $120^\circ$ . After 6 minutes, the pie is  $108^\circ$ . In the long run, the temperature of the pie will approach (but not reach)  $60^\circ$ .

When is the temperature equal to  $70^\circ$ ?

5. [10 points] You have 120 meters of fencing, and you would like to build a fence in the shape of a sector, as shown below.

- (a) Suppose you insist on using all 120 meters of fencing. Give a formula for the area of the sector,  $A$ , in terms of the radius,  $r$ .

**Note:**  $\theta$  should not be part of your answer. If it is, rewrite the formula so it isn't!



- (b) What should the radius be to **maximize** the total area?