Math 120 A Spring 2018
Mid-Term Exam Number Two
May 17, 2018

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1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all four questions.

- Show all work for full credit.

- The only calculator you may use during this exam is a TI-30XIIs. All other electronic devices are not allowed, and should be turned off and put away for the duration of the exam.

- If you use a trial-and-error or guess-and-check method when an algebraic method is available, you will not receive full credit.

- You may use one, two-sided, hand-written 8.5 by 11 inch page of notes. Write your name on your notesheet and turn it in with your exam.

- You have 50 minutes to complete the exam.

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1. Suppose that the height of a certain tree is a linear-to-linear rational function of time. Today the tree is 3 meters tall. One year from now, the tree will be 4 meters tall. Ten years from now, the tree will be 6 meters tall.

    (a) Express the height of the tree as a linear-to-linear rational function of time.

    (b) When will the tree be 6.4 meters tall?

2. City A had a population of 10000 in the year 1990. City A's population grows at a constant rate of 3% per year.

City B has a population that is growing exponentially. In the year 2000, there were half as many people in B as in A. In the year 2010, the population of A was 20% more than the population of B.

When will the populations be equal? Give your answer in years after 1990.

3. (a) Restrict the domain of $f(x) = 2x^2 + 6x - 1$ to $x \leq -\frac{3}{2}$ and find the function's inverse.

(b) Find the fixed points of the function $g(x) = 2x - \frac{1}{x+1}$.

4. You have a set of pulleys connected in pairs by belts.
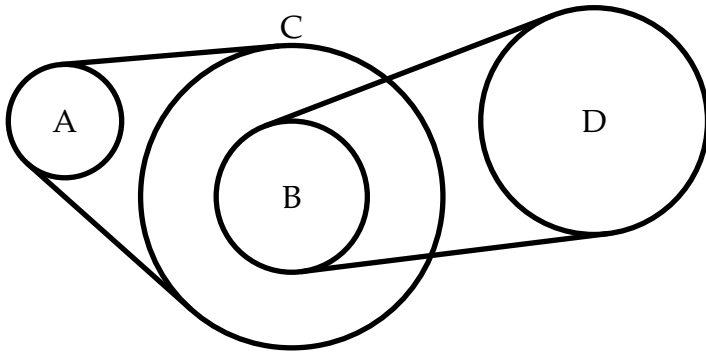
Pulley B and pulley C are attached to the same axle and rotate together.

Pulley A has a radius of 1.5 cm and rotates at the rate of one revolution every 12 seconds.

Pulley B has a radius of 2 cm.

Pulley D has a radius of 3.4 cm and rotates at the rate of 0.1 radians per second.

What is the radius of pulley C?