

Your Name

Your Signature

Student ID #

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Quiz Section (circle one)

	Hui	Santosh
10:30	BA	BC
11:30	BB	BD

Results will be posted on the Math 120B web page as soon as they are graded (by Sunday, February 24th at the latest). Please check one of the following boxes and sign above.

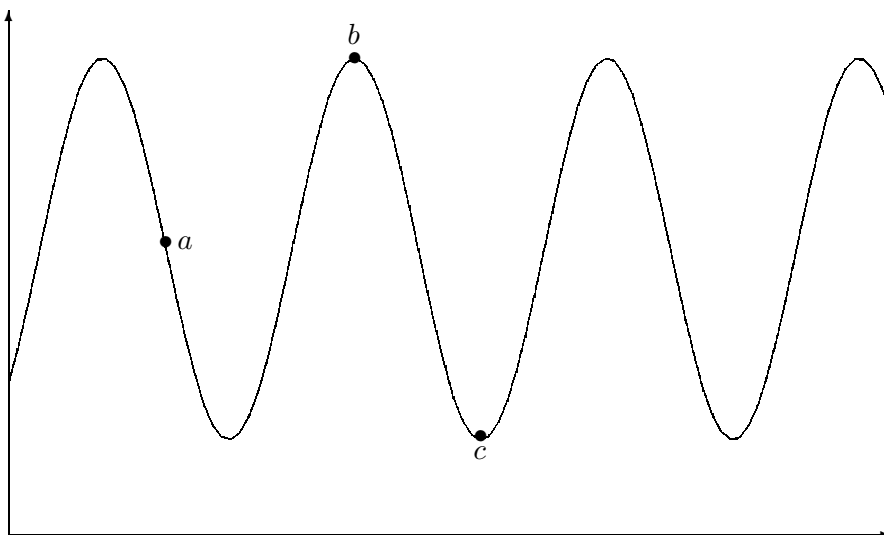
- Please post my score using the last five digits of my Student Number.
- Please post my score using the the following five digits:

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- Please do not post my score. I realize that this means I will have to wait until Tuesday to learn my score.

Problem	Total Points	Score
1	16	
2	10	
3	12	
4	12	
Total	50	

- You are allowed to use one sheet (8.5 by 11 inches) of handwritten notes for this exam. (You may write on both sides.) You are not allowed to share notes.
- You may use a scientific calculator, but not a graphing calculator. You are not allowed to share calculators.
- In order to receive partial credit, you must show your work. Be wary of doing computations in your head. Instead, write out your computations on the exam paper.
- Your answers should either be *exact answers* (like $2\sqrt{2}$) or rounded to three digits after the decimal (like 2.828) in whatever units you're using. Be careful not to round intermediate calculations whenever possible.
- Place **YOUR FINAL ANSWER** to each question in the box provided.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- Good luck!

- 1 (16 points) As a physics experiment, we have set up a mass on a near-frictionless surface, anchored by a spring to the wall. We pull the mass 10 cm from the wall, then release it. The mass then oscillates back and forth, getting as close as 2 cm to the wall, and no further than 10 cm. Assume that the distance of the mass from the wall is a sinusoidal function of time. We start timing, more or less arbitrarily, and notice that the mass is first 10 cm from the wall at time $t = 0.75$ seconds. We also notice that it takes another 2 seconds for the mass to return to this distance from the wall. Here is a unit-less graph of the distance from the wall versus time t :



- (a) (5 points) Find the coordinates of the points a , b , and c given on the graph. You may assume that the point a is on the mean line, the point b is at a maximum, and the point c is at a minimum.

$a =$

$b =$

$c =$

- (b) (5 points) The equation for the function $d(t)$ is, in standard form,

$$d(t) = A \sin\left(\frac{2\pi}{B}(t - C)\right) + D.$$

Find the values of A , B , C , and D .

$A =$

$B =$

$C =$

$D =$

- (c) (6 points) During the first two seconds of motion (that is, from $t = 0$ to $t = 2$), how much time is the mass at least 8 cm from the wall? (Half credit for finding a single time during the first two seconds when the mass is precisely 8 cm from the wall.)

For seconds.

(10 points) Suppose $f(x) = \sin^{-1}(\sqrt{x^2 - 1})$.

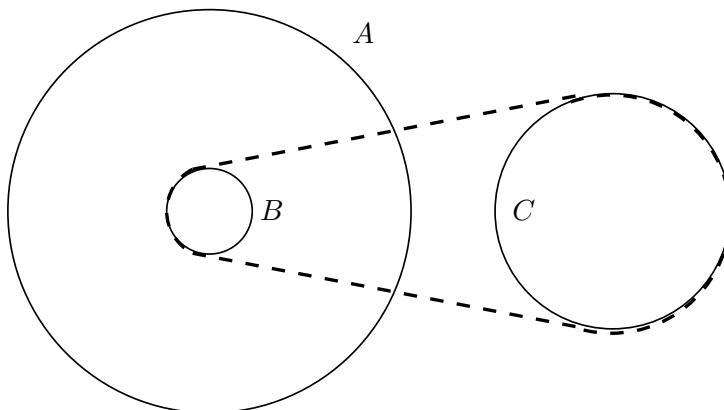
- (a) (5 points) Find a value of x so that $f(x) = \frac{\pi}{4}$.

$x =$.

- (b) (5 points) Find an inverse function $f^{-1}(x)$.

$f^{-1}(x) =$

3 (12 points) Consider the following picture. Wheels A and B are fastened at the axle, so they rotate together. Wheels B and C are connected by a belt. Wheel B has radius 10 cm and rotates at 90 RPM.



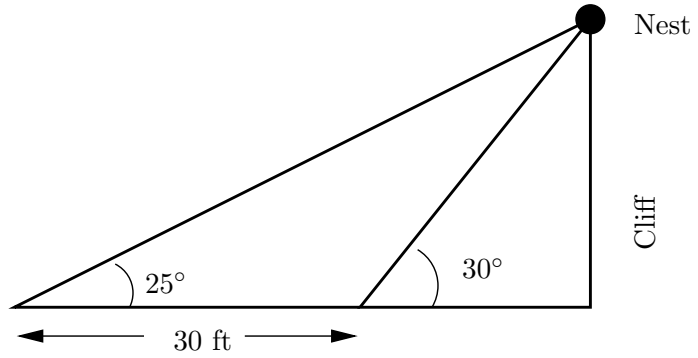
(a) (6 points) Wheel A has radius 25 cm. Find how fast a point on wheel A travels in centimeters per second.

cm / sec.

(b) (6 points) Wheel C spins at 40 RPM. Find the radius of wheel C .

The radius is cm.

4 (12 points) You are out hiking, and you see a nest on the side of a vertical cliff. Never without your trusty angle-measuring device, you carefully measure the angle from the ground to the nest as 25° . You then move 30 feet closer to the cliff and measure the angle again: this time it is 30° . (The picture to the right is not to scale.)



(a) (6 points) How far are you from the cliff? (You are at the second point: you've moved forward and the angle here is 30° .)

feet.

(b) (6 points) Assume the ground is perfectly level. How high off the ground is the nest?

feet.