

Your Name

Your Signature

Student ID #

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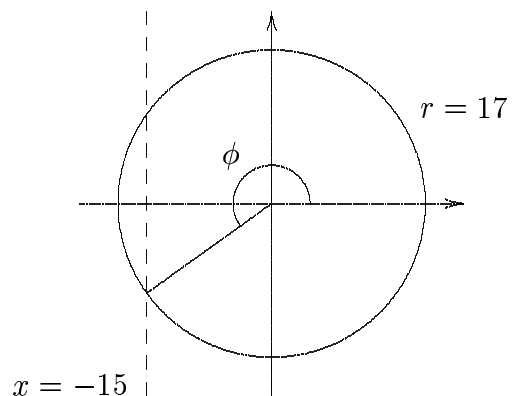
	Keir	Brett
Section	1:30	2:30
(circle one)	CA	CB
	1:30	2:30
	CC	CD

Problem	Total Points	Score
1	12	
2	13	
3	13	
4	12	
Total	50	

- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ sheet of notes.
- You are not allowed to share notes or calculators.
- In order to receive credit, you must show your work. Be wary of doing computations in your head. Instead, write out your computations on the exam paper.
- **PLACE A BOX AROUND YOUR FINAL ANSWER** to each question.
- If you use a trial and error (or guess and check) method when a more accurate and efficient algebraic method is available, you might not receive full credit.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

1 (12 points) Solve the following.

(a) (4 points) Find the angle ϕ .



(b) (4 points) Find the amplitude, period, phase shift and mean of the function $y = 2 + 5 \sin(3x + 7)$

(c) (4 points) If $\sin(\theta) = \frac{11}{61}$, what are the possible values for $\cos(\theta)$?

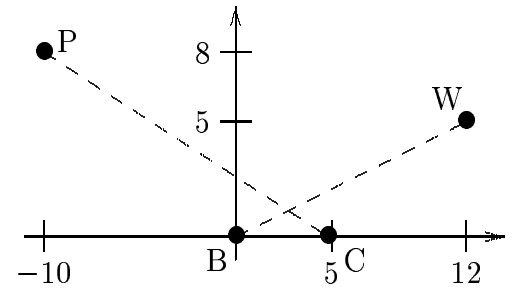
2 (13 points) Scientists are studying the population of naked mole rats on the island of Socotra. Two years after the study starts, the population reaches a minimum of 13 mole rats. The next minimum occurs 7 years after the **start** of the study. The maximum population is 49 mole rats.

(a) (5 points) Give a sinusoidal function relating the population y of naked mole rats to the number of years t since the study began.

(b) (2 points) What is the population 27 months into the study?

(c) (6 points) In the fourth year of the study, during how many months is the population of mole rats greater than 40? (The fourth year is $t = 3$ to $t = 4$).

- 3 (13 points) Beth is playing with her pet rats, Walter and Pandora, on her livingroom floor. Walter is 12 feet East and 5 feet North of Beth. Pandora is 10 feet West and 8 feet North of Beth. A piece of tasty cheese is sitting 5 feet East of Beth. Friendly Walter runs straight to Beth at a speed of 2 ft/sec. At the same time, hungry Pandora runs at 3 ft/sec straight to the cheese.



- (a) (6 points) Give parametric equations for the motion of each rat.
- (b) (3 points) Where do the paths of the two rats cross?
- (c) (4 points) Do the two rats collide?

- 4 (12 points) Clovis is admiring a large Christmas tree at the mall. Using his handy pocket sextant, he measures the angle of elevation of the tree as 22° . He moves 12 feet closer and now the angle of elevation measures 28° . Clovis is holding the sextant $5\frac{1}{2}$ feet above the ground. How tall is the tree?