

MAT 130 Spring 2005 Final

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March 4, 2005

Name:

SID:

Email (if you want me to email your grade to you):

Instructions

This is the final exam for the math course Functions. It counts for 30% of your grade. However, if your grade on the final exceeds your average for the course, then your grade on the final becomes your grade.

The exam is due on Monday, March 7, at 3:00 PM. It should be turned in by slipping it under the door of my office, room 4-116 in the Math Tower. That is on the fourth floor.

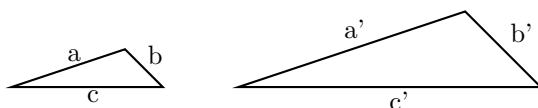
You may use a calculator, computer, or books, but please do not ask a person for help. Show your work where it is appropriate. Be neat and detailed when verifying trigonometric identities.

Units and labelling of graphs count! Each problem is worth one point. Having the right units in all the problems is worth one point. Having all of the graphs labelled correctly (intercepts, axes, and maximum and minimum values) is worth two points.

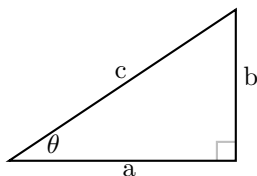
Before each question I have indicated the section from which the question comes in parentheses. The hardest questions are preceded by an asterisk; take particular care with these questions.

Good luck!

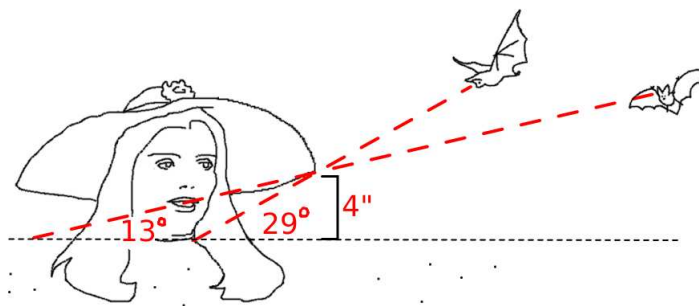
1. (1.1) What is the angle measure $71^{\circ}43'30''$ in decimal degree form?
2. (1.2) Refer to the figure below. The two triangles are similar. If $a = 15\text{cm}$, $a' = 30\text{cm}$, and $b' = 45\text{cm}$ then what is b ?



3. (1.3) Refer to the figure below. Which of the standard six trigonometric functions of θ is represented by a/b ?



For the next two questions, refer to the figure below.



Lucy is up to her neck in quicksand, and there are bats circling her. The angles of elevation of the bats and the height of her face are indicated in the figure.

4. (1.4) How wide does the brim of her hat have to be in order that the higher bat not be able to see her face at all?

5. *(1.4) How far down her face from the line of the hat can the lower bat see?
6. (2.1) What quadrant does $9\pi/4$ radians lie in?
7. (2.3) If an angle θ has a terminal side containing the point $(1, 1)$ then what is $\tan \theta$?
8. (2.5) What is $\sec \pi/3$ exactly (with radicals)? You will get no points for a decimal answer.

For the next five problems, graph over the interval $-2\pi \leq x \leq 2\pi$.

9. (3.1) Graph $y = \cos x$.
10. (3.2) Graph $y = \cos(\frac{1}{2}x)$.
11. (3.2) Graph $y = 2 \cos(\frac{1}{2}x)$.
12. (3.2) Graph $y = -2 \cos(\frac{1}{2}x)$.
13. *(3.3) Graph $y = -1 + 2 \cos(\frac{1}{2}x + \pi)$.
14. (4.1) Simplify the expression $\sec(-y) \sin(-y)$ until it is just one trigonometric function of y (not $-y$.)
15. (4.2) Verify that $\frac{1-\cos x}{1+\cos x} = \frac{\sec x-1}{\sec x+1}$.
16. (4.3) Verify that $\cos(2x) = \cos^2(x) - \sin^2(x)$ using the angle addition formula for $\cos(2x) = \cos(x+x)$. Do not use the double angle formula directly.
17. *(4.4) Verify that $\sec^2 x = (\sec 2x)(2 - \sec^2 x)$.