

College of the Redwoods  
Mathematics Department

Math 25 — Trigonometry  
Exam #3

David Arnold

## Exam Questions

**Read Carefully!** You have until Monday of next week (3/24/08) to complete the exam. The exam is due, in my hands, at the beginning of class.

This exam is open notes, open book. This includes any supplementary texts or online documents. You must answer all of the exercises on your own. You are not allowed to work in groups or pairs on the exam. You are not allowed to enlist the aid of a tutor or friend to help with the exam. You are not allowed to read the exercises in the exam, then seek help on similar questions. Once you open the exam and read the questions, you may not seek any outside help of any kind.

I am not interested in reading pages and pages of calculations without accompanying narrative. It is essential that you include sound mathematical writing that both explains and justifies your solution or proof. Grammar and punctuation are important, as is the organization of your solution on the written page. Carefully labeled sketches and diagrams are equally important.

When working in the Mathlab or in the study rooms in the Physical Sciences Building (such as rooms PS116 or PS119), please do not work near any other student who is also working on the exam. For the sake of propriety, please separate yourselves when working on the exam in these areas.

Place the solution to each exercise on a separate sheet of paper. On a good sheet of paper, write out (longhand) and sign the following honor pledge.

I promise that all work found herein is my own. I have received no help from tutors, colleagues, or other teachers. I have honored all of the exam constraints listed in the directions.

Arrange your solutions in order, place these exam page(s) on top of your solutions, then place the honor pledge on top of the exam as a cover sheet. Staple. Good luck!

EXERCISE 1. Prove each of the following identities.

$$(a) \frac{\sin B}{1 + \cos B} + \frac{1 + \cos B}{\sin B} = 2 \csc B \qquad (b) \cos^2 \beta - \sin^2 \beta = \frac{1 - \tan^2 \beta}{1 + \tan^2 \beta}$$

EXERCISE 2. Simplify each of the following expressions as much as possible. Place your final answers in simple radical form.

$$(a) \cos\left(-\frac{11\pi}{12}\right) \qquad (b) \sin \frac{\pi}{8}$$

EXERCISE 3. Given  $\tan x = 2$ ,  $\pi < x < 3\pi/2$ , and  $\tan y = -2$ ,  $\pi/2 < y < \pi$ , simplify  $\cos(x + y)$ . Use the appropriate identity and provide detailed sketches used to find the values of the various trigonometric functions of  $x$  and  $y$  needed to complete the exercise.

EXERCISE 4. Without the aid of a calculator, simplify the following expressions as much as possible. Exact answers only!

$$(a) \sin 38^\circ \cos 22^\circ + \sin 22^\circ \cos 38^\circ \qquad (b) \frac{\tan(\pi/12) - \tan(\pi/3)}{1 + \tan(\pi/12) \tan(\pi/3)}$$

$$(c) \sin(\pi/12) \cos(\pi/12) \qquad (d) 2 \sin^2(75^\circ) - 1$$

EXERCISE 5. Write  $\sin 5x \cos 7x$  as a sum.

EXERCISE 6. Write  $\cos 5\theta + \cos 3\theta$  as a product.