College of the Redwoods
Mathematics Department

Math 25 — Trigonometry
Exam #1

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Exam Questions

Read Carefully! *You have until Monday of next week (2/25/08) 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. Use a compass, ruler, and protractor to first draw an accurate right triangle $\triangle ABC$ (right angle at C) with the given measurements. Use the laws $\cos\theta = \text{adj/hyp}$, $\sin\theta = \text{opp/hyp}$, and $\tan\theta = \text{opp/adj}$ to determine the remaining parts (sides and angles) of the triangle, correct to the nearest tenth of a degree and nearest tenth of a centimeter. Check your results with your ruler and protractor.

(a) $A = 35°$, $a = 5$ cm. (b) $a = 5$ cm, $b = 6$ cm

EXERCISE 2. A man stands 200 feet from the base of a multi-story building on level ground. A flagpole sits atop the building. From the man's position, the angle of elevation to the bottom of the flagpole is 43°. From the man's position, the angle of elevation to the top of the flagpole is 44°. Draw a schematic of this situation and label each part. Use right-triangle trigonometry to find the height of the flagpole, correct to the nearest tenth of a foot.

EXERCISE 3. Change 18° to radian measure.

EXERCISE 4. Change $7\pi/15$ radians to degree measure.

EXERCISE 5. A ferris wheel of radius 30 feet makes one complete revolution every minute.

(a) Find the angular speed of the ferris wheel in radians per second.

(b) Find the linear speed of a rider on the circumference of the ferris wheel in feet per second.

EXERCISE 6. Given that $\tan\theta = -1/2$, where $\pi/2 < \theta < \pi$, find the five remaining trigonometric functions of θ. Use the definition on page 582 of your text and include a sketch similar to those in Figures 26, 27, and 28 on pages 562-563 of your text. Place your final answers in simple radical form.

EXERCISE 7. Find two angles θ that lie between 0° and 360° so that $\sin\theta = -3/4$. Round your answers to the nearest tenth of a degreee. Please include carefully labeled reference angle sketches with each answer.

EXERCISE 8. Find two angles θ that lie between 0 and 2π radians so that $\sec\theta = -3$. Round your answers to the nearest hundredth of a radian. Please include carefully labeled reference angle sketches with each answer.

EXERCISE 9. A regular polygon is one in which all sides and all angles have the same measure. A dodecagon is a regular polygon with 12 sides. Suppose that a dodecagon is inscribed in a circle of radius 1 inch.

(a) Find the area of the dodecagon. Include a labeled sketch to support your work. Find an exact answer first, in terms of trigonometric functions of angles, then round your answer to the nearest tenth of a square inch.

(b) Find the perimeter of the dodecagon. Include a labeled sketch to support your work. Find an exact answer first, in terms of trigonometric functions of angles, then round your answer to the nearest tenth of an inch.