College of the Redwoods
Mathematics Department

Math 25 — Trigonometry
Final Exam

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Exam Questions

Read Carefully! *Place the solution to each exercise on your own paper. Arrange your solutions in order, place these exam page(s) on top of your solutions, then staple. Good luck!*

EXERCISE 1. 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 2. Sketch one period of the graph of $y = \pi \sin(x/2)$. State the amplitude and period.

EXERCISE 3. Sketch one period of the graph of $y = -\csc(\pi x - \pi/4)$. State the amplitude, period, and phase shift.

EXERCISE 4. Prove the following identity.

$$\frac{\sin B}{1+\cos B} + \frac{1+\cos B}{\sin B} = 2\csc B$$

EXERCISE 5. Simplify the expression $\sin(\pi/8)$ as much as possible. Place your final answer in simple radical form.

EXERCISE 6. 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 7. Simplify the expression $\cos(2\sin^{-1}(-1/4))$ as much as possible. Make sure your final answer is in simple radical form. Please include carefully labeled sketches with your solution.

EXERCISE 8. Solve the trigonometric equation $4 + 5\sin x = 2\cos^2 x$ for x. Your answers must be presented in radians and be restricted to the interval $[0, 2\pi)$.

EXERCISE 9. An airplane flies on a bearing of 58° at 400 miles per hour. A wind blowing from west to east at 30 miles per hour blows the plane off course. Find the resulting speed of the plane and its bearing. Please include detailed sketches with your solution. Round your answer to the nearest mile per hour and the nearest tenth of a degree.

EXERCISE 10. Simplify $(-1+\sqrt{3}i)^6$. You should be able to do this without the use of a calculator. Show all of your work.

EXERCISE 11. Without the use of a calculator, sketch the graph of $y^2 - 8x + 4y + 12 = 0$. Label the vertex and focus with their coordinates. Plot and label the directrix with its equation. State the length of the latus rectum and use it to help sketch the graph of the given parabola.