Math 182: Trigonometry
Practice Quiz 5

This practice quiz will give you an idea of the format and difficulty level of the actual quiz. Like the actual quiz, it consists of 26 questions drawn from the problem sets and modified slightly (e.g. by changing the numbers). Any problem on the problem sets can appear on the actual quiz; it is not enough just to know how to solve the problems on this practice quiz.

No partial credit will be given for wrong answers. You will be graded on the best 25 of the 26 questions, so you can get one answer wrong without penalty. You cannot score more than 100% on the quiz.

Read the instructions carefully and follow them exactly. Your answers on the answer page must exactly match the solutions, or they will be graded as wrong.

If the question asks that you round the answer to a certain number of decimal places, you must do so. Your answer will be considered wrong if it is rounded incorrectly, or to the wrong number of decimal places.

Unless you’re told to round your answer, it should be exact. Some things that can cause you to lose credit for an exact answer are:

- Failure to simplify fractions. $\frac{15}{20}$ is wrong; $\frac{3}{4}$ is correct.
- Failure to rationalize denominators. $\frac{2}{\sqrt{3}}$ is wrong; $\frac{2\sqrt{3}}{3}$ is correct.
- Failure to simplify radicals. $\sqrt{18}$ is wrong; $3\sqrt{2}$ is correct.
- Using decimal approximations instead of exact answers. 1.0472 is wrong; $\frac{\pi}{3}$ is correct.

On problems where the answer involves units of measure (e.g. “23 ft”), you won’t lose credit for not including the units. However, it’s a good idea to do so. Your answer must be in the correct units: if, for example, the correct answer is “30°”, then “π/6” will be graded as wrong.

If your answer includes a vector, you must indicate this clearly. “$\vec{U}$” is correct: “$U$” is not. You should use arrows to indicate most vectors; hats to indicate standard unit vectors (“$\hat{i}$”). Do not attempt to indicate boldface in handwritten answers.

**No partial credit will be given.** If you get one component of a vector right and the other wrong, or if you get the magnitude right and the direction wrong, then the whole answer will be graded as wrong.

Your answers must appear in the correct format on the answer sheet. If no answer or a wrong answer appears there, the grader will not check the page with the question to see if you’ve answered it correctly there. That means it’s a good idea to double-check at the end of the quiz and make sure that you’ve copied the answers correctly and in the right places on the answer sheet.
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Practice Quiz 5

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 1 |   | 10|   | 19|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2 |   | 11|   | 20|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 |   | 12|   | 21|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4 |   | 13|   | 22|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5 |   | 14|   | 23|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6 |   | 15|   | 24|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7 |   | 16|   | 25|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8 |   | 17|   | 26|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 |   | 18|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

Name_________________________ Date___________ Score_____ Grader__________
This quiz consists of 26 multiple-choice and short-answer questions. There will be no partial credit for wrong answers. You will be graded on the best 25 of the 26, so you can get one question wrong without penalty. You cannot get a higher grade than 100% on this quiz.

Write only your answers in the spaces provided on the answer page. Circle the correct answers for multiple-choice questions. Do not do your work on the answer page.

Write your answers in exactly the format that the question asks for. If, for example, you round to the wrong number of decimal places, or fail to rationalize denominators or simplify fractions in exact solutions, your answer will be graded as wrong.

Unless otherwise indicated, your answers should be exact. Rationalize all denominators and simplify all fractions.

Your answer must be in the correct units of measure. If, for example, the problem asks for an angle in degrees, then an answer given in radians would be considered wrong.

If your answer includes a vector, you must indicate this clearly. “\( \vec{U} \)” is correct: “\( U \)” is not. You should use arrows to indicate most vectors; hats to indicate standard unit vectors (“\( \hat{i} \)”). Do not attempt to indicate boldface in handwritten answers.

No partial credit will be given. If you get one component of a vector right and the other wrong, or if you get the magnitude right and the direction wrong, then the whole answer will be graded as wrong.

Your grade will be based on the answers that you write on the answer page. If you have a wrong answer or no answer on the answer page, the grader will not look at the page with the question to see if the correct answer appears there. Illegible or ambiguous answers will be graded as wrong. You are responsible for copying your answers clearly, correctly, and in the appropriate blanks.

You must show your work on the page with the question. Credit will not be given for lucky guesses.
1. Find the angle between the vectors \( \mathbf{U} = -\mathbf{i} + 3\mathbf{j} \) and \( \mathbf{V} = \mathbf{i} + 3\mathbf{j} \). Your answer should be exact and in the range \([0, 2\pi)\): an angle if possible, an inverse trigonometric function if necessary.

2. \( \mathbf{U} = \langle 3, 4 \rangle \), \( \mathbf{V} = \langle -3, 3 \rangle \). Decompose \( \mathbf{V} \) into two vector components: \( \mathbf{V}_1 \) parallel to \( \mathbf{U} \) and \( \mathbf{V}_2 \) perpendicular to \( \mathbf{U} \). What is \( \mathbf{V}_2 \)? Your answer should be exact.

3. \( \mathbf{V} \) has magnitude 19 and direction 1.82 rad. If \( \mathbf{V} = \langle V_x, V_y \rangle \), what is \( V_y \)? Use a calculator or equivalent; round your answer to four decimal places.

4. \( \mathbf{U} = \langle -5, 8 \rangle \), \( \mathbf{V} = \langle 3, 7 \rangle \). Use a calculator or equivalent to find the angle between \( \mathbf{U} \) and \( \mathbf{V} \). Round your answer to the nearest 0.0001 rad.

5. \( \mathbf{U} = \langle 9, -10 \rangle \), \( \mathbf{V} = \langle -5, y \rangle \). If \( \mathbf{U} \) is perpendicular to \( \mathbf{V} \), find \( y \). Your answer should be exact.

6. \( \mathbf{U} = 4\mathbf{i} + 7\mathbf{j} \), \( \mathbf{V} = -5\mathbf{i} + 3\mathbf{j} \). What is \( \mathbf{U} \cdot \mathbf{V} \)? Your answer should be exact.

7. \( \mathbf{U} = 4\mathbf{i} + 9\mathbf{j} \), \( \mathbf{V} = 3\mathbf{i} - 11\mathbf{j} \). Use a calculator or equivalent to find the angle between \( \mathbf{U} \) and \( \mathbf{V} \). Your answer should be in the range \([0^\circ, 180^\circ]\). Round your answer to the nearest 0.01°.

8. \( \mathbf{U} = \langle 14, -9 \rangle \), \( \mathbf{V} = \langle -7, -3 \rangle \). Find \( \mathbf{U} + \mathbf{V} \).

9. \( \mathbf{U} \) is a vector with magnitude 20 and direction \( \pi/6 \). \( \mathbf{V} \) is a vector with magnitude 10 and direction \( -\pi/6 \). Write \( \mathbf{U} - \mathbf{V} \) in component form. Your answer should be exact.

10. \( \mathbf{U} = \langle -3, 7 \rangle \). What is the magnitude of \( \mathbf{U} \)? Your answer should be exact.

11. Because of the rising price of gas, you have acquired two oxen to pull your SUV. One ox is pulling with a force of 412 lbs in a direction 8.8° to the right of the road. The other ox is pulling with a force of 335 lbs in a direction 6.0° to the left of the road. What is the total force on the SUV in the direction of the road? Round your answer to the nearest pound.

12. \( \mathbf{U} \) is a vector with magnitude 24 and direction 0.312 rad. \( \mathbf{V} \) is a vector with magnitude 16 and direction 2.285 rad. Find the magnitude of \( \mathbf{U} + \mathbf{V} \). Round your answer to the nearest 0.0001.

13. \( \mathbf{V} = \langle -7, 3 \rangle \). Find a unit vector \( \mathbf{v} \) in the same direction as \( \mathbf{V} \). Your answer should be exact.

14. \( \mathbf{U} \) is a vector with magnitude 9 and direction 22.1°. \( \mathbf{V} \) is a vector with magnitude 13 and direction \( -5.8^\circ \). Write \( \mathbf{U} - \mathbf{V} \) in component form. Round your answer to the nearest 0.0001.

15. \( \mathbf{V} = 4\mathbf{i} - 3\mathbf{j} \). What is \( 4\mathbf{V} \)?

16. \( \mathbf{U} = 5\mathbf{i} + 14\mathbf{j} \). If \( \mathbf{U} - \mathbf{V} = 8\mathbf{i} + 4\mathbf{j} \), what is \( \mathbf{V} \)?
17. $\mathbf{V} = \langle 5\sqrt{3}, -5 \rangle$. What is the direction of $\mathbf{V}$? Your answer should be exact and in the range $[0, 2\pi)$: an angle if possible, an expression involving an arc function of a positive number if necessary.

18. $\mathbf{U} = \langle 12, -4 \rangle$. $\mathbf{V} = \langle -3, 2 \rangle$. What is $\mathbf{U} - \mathbf{V}$?

19. $\mathbf{U}$ is a vector with magnitude 8 and direction $2\pi/3$. $\mathbf{V}$ is a vector with magnitude 10 and direction $\pi/3$. Write $\mathbf{U} + \mathbf{V}$ in component form. Your answer should be exact.

20. $\mathbf{U} = \langle 5, 12 \rangle$. Find a unit vector $\mathbf{v}$ perpendicular to $\mathbf{U}$ whose first component is positive. Your answer should be exact.

21. $\mathbf{V}$ is a vector with magnitude 6 and direction $5\pi/4$. Write $\mathbf{V}$ in terms of standard unit vectors. Your answer should be exact.

22. $\mathbf{V} = \langle -13, -3 \rangle$. Use a calculator or equivalent to find the direction of $\mathbf{V}$. Round your answer to the nearest 0.0001 rad. Your answer should be in the range $[0, 2\pi)$.

23. An airplane flies in a straight line for 246 miles on a course 12.8° north of east. It then flies an additional 498 miles on a course 34.0° south of east. At the end of this time, how far is it from its starting point? Round your distance to the nearest mile.

24. $\mathbf{U}$ has magnitude 4 and direction $1.710$ rad. $\mathbf{V}$ has magnitude 7 and direction $0.104$ rad. What is the direction of $\mathbf{U} + \mathbf{V}$? Round your answer to the nearest 0.001 rad. Your answer should be in the range $[0, 2\pi)$.

25. $\mathbf{V}$ has magnitude 15 and direction $\pi/7$. If $\mathbf{V} = \langle V_x, V_y \rangle$, what is $V_x$? Your answer should be exact.

26. $\mathbf{U} = \langle -1, 5 \rangle$. $\mathbf{V} = \langle 4, 5 \rangle$. Decompose $\mathbf{V}$ into two vector components: $\mathbf{V}_1$ parallel to $\mathbf{U}$ and $\mathbf{V}_2$ perpendicular to $\mathbf{U}$. What is $\mathbf{V}_1$? Your answer should be exact.