

MATH 1316: STUDY GUIDE FOR MIDTERM

1. TOPICS YOU SHOULD KNOW

The exam will cover the following topics:

- The right triangle definitions of the six trig functions.
- Solving a right triangle.
- Using inverse trig functions to solve for angles and simplify expressions.
- Reference angles and what it means for angles to be coterminal.
- The *XYR* definitions of the six trig functions.
- Using the laws of sines and cosines to solve non-right triangles.
- Finding the area of a triangle using formulas.
- Using trig to calculate distances, knowing other distances and angles.
- Basics of vectors, including what it means and how to add vectors, and how to convert between x, y component form and magnitude/direction form.

2. FORMULAS I WILL GIVE YOU

I will give you the following formulas on the exam:

$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$$
$$c^2 = a^2 + b^2 - 2ab \cos \gamma$$
$$\text{Area} = \frac{ab \sin \gamma}{2}$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}; \quad s = \frac{a+b+c}{2}$$

What I will not give you, but will expect you to know are:

- The Pythagorean theorem;
- The right triangle definitions of the six trig functions and *XYR* definitions of the trig functions.

3. SAMPLE QUESTIONS

Here are some sample questions, to give you an idea of the sorts of problems you should know how to solve. For the exam, calculators are allowed and for most questions you can either give exact answers or decimal approximations. For a few questions, however, I will ask only for exact answers.

- (1) The two legs of a right triangle with angle α have length 5 and 12. Find all six trig functions of α .
- (2) A right triangle has an angle of 20° and a hypotenuse of length 7. Find all angles and side lengths of the triangle.
- (3) Simplify the expression $\sin(\cos^{-1}(2/9))$ to not use any trig functions or inverse trig functions.
- (4) You know that the angle α is in Quadrant 3 and that β is the reference angle for α . If you know that $\sin \beta = 1/\sqrt{5}$, determine $\sin \alpha$, $\cos \alpha$, and $\tan \alpha$.
- (5) Consider the angle 420° . Find the angle between 0° and 360° which is coterminal with it, and determine its reference angle.
- (6) A triangle has a side of length 10 flanked by angles of measure 25° and 65° . Find all angles and side lengths of the triangle.
- (7) A triangle has a 100° angle flanked by sides of length 3 and 6. Find all angles and side lengths of the triangle.
- (8) You own a 40 foot tall ladder. If a wall has a height of 32 feet, at what angle do you need to put your ladder against the wall to reach the top?

- (9) For safety reasons, you only use your 40 foot tall ladder at an angle between 50° and 75° degrees above the ground. What is the range of possible heights at which you can use your ladder?
- (10) Consider the vector $\langle 4, -3 \rangle$. Determine its magnitude and direction. (Give the direction as an angle in standard form.)
- (11) Consider the two vectors \vec{a} and \vec{b} , where \vec{a} has magnitude 2 and has the angle 45° as its direction and \vec{b} has magnitude 3 and the angle -90° as its direction. Write $\vec{a} + \vec{b}$ in $\langle x, y \rangle$ component form.