

Math 229: Final Exam Review

Bring your scientific calculator to the exam.

Review for Final practice: Go back and redo all of the old problems from Tests 1 – 4. Where you struggle is where you need more practice. Go back to the relevant sections to review concepts you're weak on. Most of the final exam will have problems similar to the old exams so I STRONGLY encourage you to thoughtfully redo these problems. Try to do these problems without looking at your previous solutions; i.e., treat the problems as a loooooong practice final.

Be sure to also review Section 10.5 since this section was not on any of the previous exams.

You may have one 8 ½ x 11 sheet of formulas, identities, definitions, etc. for the Final Exam. I'll check it before the exam...make sure it doesn't have solved problems on it!

What's allowed

What's not allowed

The Big Ideas (As you read these, write down relevant formulas and/or sketch graphs)

General

- Know the difference between an EXACT value and an APPROXIMATION (e.g., $\sqrt{2}$ is EXACT, whereas 1.4142 is an APPROXIMATION of $\sqrt{2}$)

Angles

- Identify the initial side and terminal side of an angle.
- Graph angles on the xy-coordinate system. This means you should know...
 - Standard position of an angle
 - Positive vs. negative angles
- Find one or more coterminal angles for a given angle.
- Convert between radians and degrees.
- Find Arclength and Area of a sector.

Fundamental Trig Definitions

- Know the definition of each of the six trigonometric functions, in terms of
 - a right triangle
 - the general xy-coordinate system
 - the Unit Circle
- Know the Reciprocal Identities for secant, cosecant, and cotangent
- Evaluate any of the six trig functions,
 - given a general right triangle
 - given an 30-60-90 or 45-45-90 triangle
- Use your calculator to evaluate any of the six trig functions for a given angle.
 - You can find $\sin\theta$, $\cos\theta$, and $\tan\theta$ directly on the calculator.
 - You will have to use the Reciprocal Identities to find $\csc\theta$, $\sec\theta$, and $\cot\theta$ when using a calculator.
- Use your calculator (using inverse trig functions) to find an angle.

Triangles

- Memorize the sides of the basic 30-60-90 triangles
- Memorize the sides of the basic 45-45-90 triangle
- Use the Pythagorean Theorem to solve right triangles (find all missing sides and angles).
- Use Law of Sines and Law of Cosines to solve oblique (non-right) triangles.

Graphing

- Know and be able to sketch the basic graphs for all six trig functions, including period.
- Be able to identify the amplitude, find the period, vertical shift, and phase shift of a sine or cosine function given either
 - The equation
 - A graph
- Graph a sine or cosine function, including all of the above.
- Understand that vertical asymptotes are created when there is DIVISION by ZERO in a function.
- Know domain restrictions of tangent, cotangent, secant, and cosecant functions (Thou shalt not divide by 0!)

Even/Odd Functions: Know which trig functions are even and which are odd.

Even functions $f(-x) = f(x)$ Odd functions: $f(-x) = -f(x)$

Graphical View: Even functions: Symmetry w.r.t. the y-axis

Odd functions: Symmetry w.r.t. the origin (180° rotational symmetry)

Inverses and Inverse Trig Functions

- Know that inverse functions switch x and y, including the axes when graphing.
Example: Graph $y = \sin(x)$ then graph the inverse by showing the sine graph oscillating on the y-axis (see notes on this)
- Restricted Range: Why is the range restricted for the inverse trig functions? (Examine the inverse graph from above and note that it is not the graph of a function.)
- Evaluate the composition of trig and inverse trig functions

Example: $\sin(\cos^{-1}(x)) = \text{what?}$ Sketch the triangle $\theta = \cos^{-1}\left(\frac{x}{1}\right)$, find the missing side using the

Pythag. Theorem, then find the sine using the triangle. Answer: $\frac{\sqrt{1-x^2}}{1} = \sqrt{1-x^2}$

Identities:

- Derive one identity from another (example: Use the Sum of Angles Identity to derive the Double Angle Identity for either sine or cosine)
- Proofs of Identities: Start on one side, use identities and substitution to “massage” the one side into the form of the other side.

Solving Equations:

For a given trig equation, be able to find the General Solution as well as Particular Solutions from 0 to 2π .

Types of equations:

- Basic Equations
- Factor to solve
- Clear fractions to solve
- Recognize “mismatches” in either the angle or the type of trig function. Use identities to eliminate the mismatch.
- Solve equations with multiple angles such as $\cos(2x)$ or $\sin(5x)$, etc.

Polar Coordinates and Graphs

- Plot and Convert points or equations from rectangular to polar coordinates and vice versa.

Vectors:

- Know the definition of a vector
- Distinguish between a vector and a scalar quantity
- Find vector components, given a magnitude and direction.
- Find the magnitude and direction of a vector, using its vector components.
- Find the Resultant from the sum of vectors.
- Apply vectors in solving problems involving displacement, velocity
- Find the Dot Product of two vectors

Complex numbers:

Be able to graph a complex number z .

Find the absolute value $|z|$ and relate it to the graph.

Convert between standard form $z = a + bi$ and Trig (polar) form $z = |z|cis(\theta)$