Unit Circle Function Table

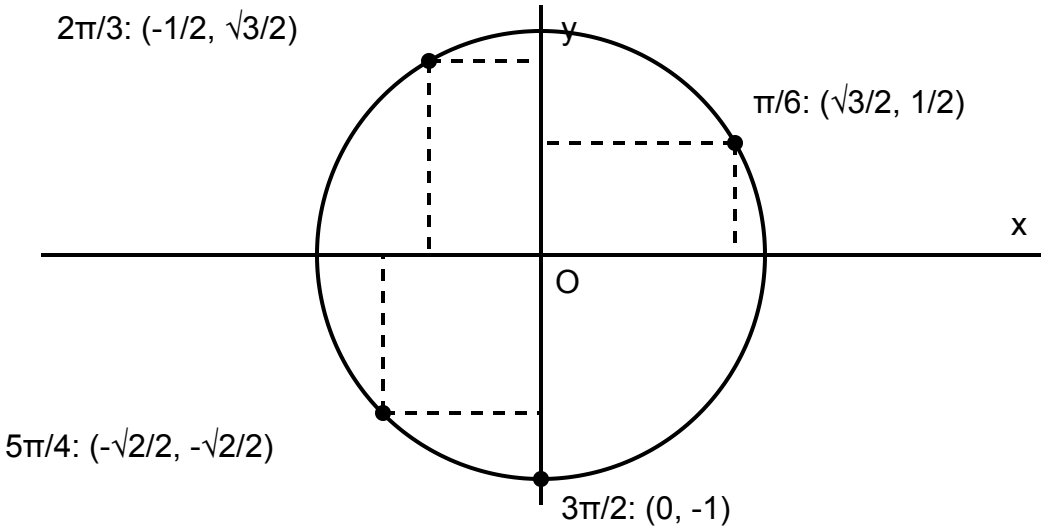
Use unit-circle coordinates to find all six trigonometric functions for radian angles.

Name: _____ Date: _____

Part 1 - Unit-circle reference

Directions: On the unit circle, a point has coordinates (x, y). Use the coordinate ratios below. Keep radicals exact. A ratio is undefined when its denominator is 0.

sin(θ) = y
cos(θ) = x
tan(θ) = y/x
csc(θ) = 1/y
sec(θ) = 1/x
cot(θ) = x/y



Quick sign check: Quadrant I: all positive. Quadrant II: sine and cosecant positive. Quadrant III: tangent and cotangent positive. Quadrant IV: cosine and secant positive.

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Part 2 - Calculate and explain

1. Complete the table using the labeled points on Part 1. Write **undefined**, not a fraction with 0 in the denominator.

Function	π/6	2π/3	5π/4	3π/2
sin(θ)				
cos(θ)				
tan(θ)				
csc(θ)				
sec(θ)				
cot(θ)				

2. Show coordinate-ratio work for tan(2π/3), sec(5π/4), and cot(3π/2). Then state why tan(3π/2) is undefined but cot(3π/2) is defined.

3. Circle the angle in the table where tangent is undefined: π/6 2π/3 5π/4 3π/2

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Answer key and teaching notes

Answers

Function	π/6	2π/3	5π/4	3π/2
sin	1/2	√3/2	-√2/2	-1
cos	√3/2	-1/2	-√2/2	0
tan	√3/3	-√3	1	undefined
csc	2	2√3/3	-√2	-1
sec	2√3/3	-2	-√2	undefined
cot	√3	-√3/3	1	0

Item 2 reasoning: tan(2π/3) = (√3/2)/(-1/2) = -√3. sec(5π/4) = 1/(-√2/2) = -√2. cot(3π/2) = 0/(-1) = 0. tan(3π/2) = (-1)/0, so it is undefined; cotangent is x/y, so 0/(-1) is defined. Item 3: 3π/2.

Exact setup: Print and supply all student pages, keeping teacher-key pages separate. Display or distribute the Part 1 unit-circle reference before students begin Part 2. Place students individually or in pairs. Give each student a pencil. If using a class display, project the supplied unit-circle reference at full size.

Materials: Supplied: all student pages with the unit-circle diagram, coordinate/radian labels, and six-function table. Additionally needed: pencil; optional projector or document camera; optional large classroom unit circle.

Teaching script (read aloud): “A unit-circle point is (x, y). Cosine is x and sine is y. Build tangent as y divided by x. Build the reciprocal functions from coordinate ratios: cosecant is 1 divided by y, secant is 1 divided by x, and cotangent is x divided by y. Do not assume cotangent is available only when tangent is available. Check the denominator in each ratio.”

Observation method: While students work, scan first for whether they copy x for cosine and y for sine. Next, ask one student at 3π/2, “What is the denominator of tangent?” Record a check if the student identifies x = 0 and writes undefined for tangent, while retaining cotangent = 0. Confer if a student reverses x and y, misses quadrant signs, or writes a reciprocal with an incorrect denominator.

Source credit: New York State Next Generation Mathematics Learning Standards, AII-F.TF.2, provided task contract. Standard page: https://lessonmakerpro.com/standards/ny-nextgen-math/aii-f-tf-2