

MIDTERM 3 – PART 1

(CHAPTER 4)

INTRODUCTION TO TRIGONOMETRY; MATH 141 – SPRING 2024 – KUNIYUKI
150 POINTS TOTAL: 32 FOR PART 1, AND 118 FOR PART 2

Show all work, simplify as appropriate, and use “good form and procedure” (as in class).

Box in your final answers!

No notes or books allowed.

PART 1: USING SCIENTIFIC CALCULATORS (32 PTS.)

If you round off at intermediate steps, round off to at least five significant digits.

Write units where appropriate in your final answers.

- 1) A circle has radius 6 meters. What is the arc length intercepted by a central angle of 2 radians? (3 points)

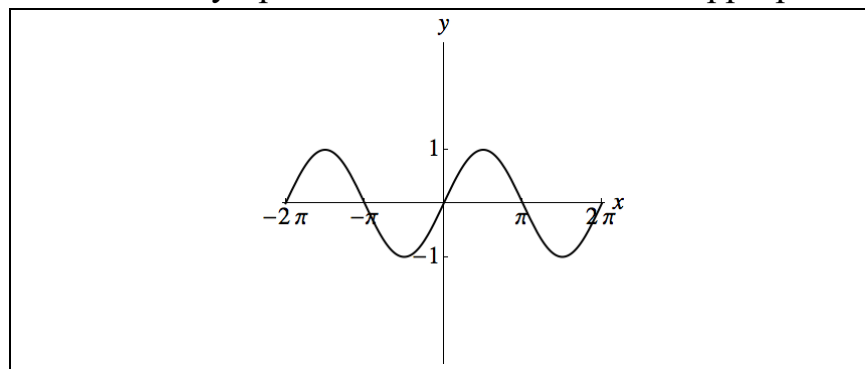
- 2) Give the solutions for $\sin(\theta) = 0.7$, where $0 \leq \theta < 2\pi$. Give your answers in **radians** and in solution set form, and round them off to the nearest thousandth of a radian (that is, to three decimal places). (4 points)

- 3) Give the solutions for $\tan(\theta) = -3$, where $0 \leq \theta < 2\pi$. Give your answers in **radians** and in solution set form, and round them off to the nearest thousandth of a radian (that is, to three decimal places). (5 points)

- 4) Write $\cos\left(\tan^{-1}\left(\frac{x}{4}\right)\right)$, also written as $\cos\left(\arctan\left(\frac{x}{4}\right)\right)$, as an equivalent algebraic expression, as in class. Assume x is in the domain of the expression. (7 points)

- 5) A 15-foot ladder is leaning against a tall vertical building that is standing upright and perpendicular from the flat ground. The angle of elevation of the ladder from the ground is 38° . How far is the bottom of the ladder from the bottom of the building? Round off your answer in decimal form to three significant digits. (8 points)

- 6) The graph of $y = \sin(x)$ appears in the box below. Graph two cycles of the graph of $y = \csc(x)$ in the box below by using the graph of $y = \sin(x)$ as a guide. Draw vertical asymptotes as dashed lines where appropriate. (5 points)



MIDTERM 3 – PART 2

(CHAPTER 4)

**INTRODUCTION TO TRIGONOMETRY; MATH 141 – SPRING 2024 – KUNIYUKI
150 POINTS TOTAL: 32 FOR PART 1, AND 118 FOR PART 2**

Show all work, simplify as appropriate, and use “good form and procedure” (as in class).

Box in your final answers!

No notes or books allowed.

PART 2: NO CALCULATORS ALLOWED! (118 POINTS)

If you are asked to evaluate an expression that is undefined, write “und.”

7) Fill out the table below. Rationalize denominators and simplify wherever appropriate. You do not have to show work. (28 points total)

θ	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$	$\sec(\theta)$
0				
$\frac{\pi}{6}$				
$\frac{\pi}{4}$				
$\frac{\pi}{3}$				
$\frac{\pi}{2}$				
xxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx
π				
$\frac{4\pi}{3}$				

8) Convert 70° into radians. (3 points)

9) If θ is an angle such that $\cos(\theta) > 0$ and $\sin(\theta) < 0$, what quadrant is θ in?

(As usual, we consider angles in standard position.) Box in one. (3 points)

Quadrant I

Quadrant II

Quadrant III

Quadrant IV

10) Complete the Identities. Fill out the table below so that, for each row, the left side is equivalent to the right side, based on the type of identity (ID) given in the last column. (8 points total)

Left Side	Right Side	Type of Identity (ID)
$\cot(\theta)$		Quotient ID
$\tan^2(\theta) + 1$		Pythagorean ID
$1 + \cot^2(\theta)$		Pythagorean ID
$\sin\left(\frac{\pi}{2} - \theta\right)$		Cofunction ID

11) Which is greater? Box in one: $\cos(40^\circ)$ $\cos(50^\circ)$. (2 points)

12) The equation $y = -3\sin(-5x)$ has the same graph as which of the following?

Box in one: $y = -3\sin(5x)$ $y = 3\sin(5x)$. (2 points)

13) Evaluate $\sin\left(\frac{8\pi}{3}\right)$. (4 points)

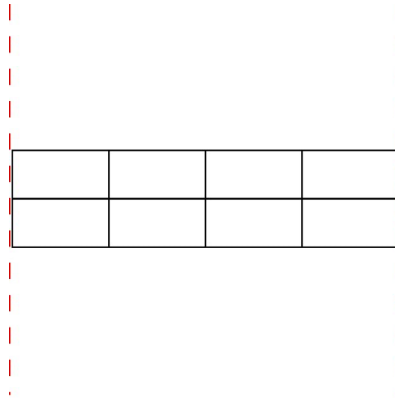
14) Evaluate $\cot\left(-\frac{5\pi}{2}\right)$. (4 points)

- 15) Fill out the table below. Use interval form (the form with parentheses and/or brackets) except where indicated. You do not have to show work. (24 points)

$f(x)$	Domain	Range
$\cos(x)$		
$\tan(x)$	Use set-builder form.	
$\sec(x)$	Use set-builder form.	
$\csc(x)$	Use set-builder form.	
$\sin^{-1}(x)$		
$\cos^{-1}(x)$		

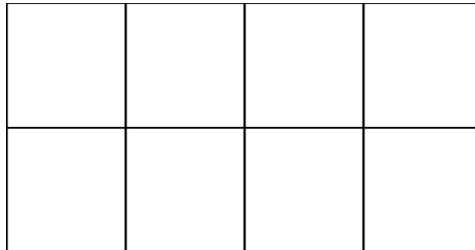
- 16) Graph one cycle of $y = 2 \tan\left(\frac{1}{3}x\right)$.

Simplify and clearly label all key x - and y -coordinates next to each corresponding grid line. Superimpose the x - and y -axes. If you do not use the frame, make sure you provide all required information. (10 points)



17) Graph one cycle of $y = 4\cos\left(5x + \frac{\pi}{2}\right) - 3$.

Simplify and clearly label all key x - and y -coordinates next to each corresponding grid line. Superimpose the x - and y -axes. If you do not use the frame, make sure you provide all required information. (16 points)



18) Evaluate $\arccos\left(-\frac{1}{2}\right)$, also written as $\cos^{-1}\left(-\frac{1}{2}\right)$. (3 points)

19) True or False: $\tan(\arctan(3)) = 3$. Box in one: True False . (2 points)

20) Evaluate $\arcsin\left(\sin\left(\frac{7\pi}{6}\right)\right)$, also written as $\sin^{-1}\left(\sin\left(\frac{7\pi}{6}\right)\right)$. (3 points)

21) Graph $y = \tan^{-1}(x)$, also known as $y = \arctan(x)$. Draw in the x - and y -axes, and clearly indicate any asymptotes and corresponding coordinates. (6 points)