

MIDTERM 3 – PART 1

(CHAPTER 4)

INTRODUCTION TO TRIGONOMETRY; MATH 141 – SPRING 2022 – 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 central angle of a circle of radius 12 centimeters intercepts an arc of length 2 centimeters along the circle. What is the radian measure of this angle?
(4 points)

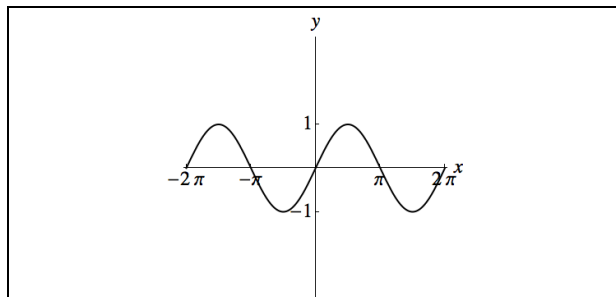
- 2) Give the solutions for $\tan(\theta) = 6$, where $0^\circ \leq \theta < 360^\circ$. Give your solutions in **degrees** and in solution set form, and round them off to the nearest tenth of a degree (that is, to one decimal place). (3 points)

- 3) Give the solutions for $\cos(\theta) = -0.75$, where $0 \leq \theta < 2\pi$. Give your solutions 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) A nomad child lying on the flat ground is flying a kite on a straight wire of length 96 feet. At a particular time, the angle of elevation from the nomad child to the kite is 54° . What is the height of the kite from the ground at that time? Round off your answer in decimal form to three significant digits. (8 points)

5) Write $\tan\left(\sin^{-1}\left(\frac{x}{3}\right)\right)$, also written as $\tan\left(\arcsin\left(\frac{x}{3}\right)\right)$, as an equivalent algebraic expression, as in class. Assume x is in the domain of the expression. (7 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 2022 – 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) 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. (10 points total)

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

- 9) Convert 10° into radians. (2 points)

- 10) Fill out the table below. Use interval form (the one 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.	
$\cot(x)$	Use set-builder form.	
$\csc(x)$	Use set-builder form.	
$\sin^{-1}(x)$		
$\cos^{-1}(x)$		

11) The equation $y = 7 \sin(-4x)$ is equivalent to ... (Box in one:). (2 points)

$$y = 7 \sin(4x)$$

$$y = -7 \sin(4x)$$

12) The equation $y = 7 \cos(-4x)$ is equivalent to ... (Box in one:). (2 points)

$$y = 7 \cos(4x)$$

$$y = -7 \cos(4x)$$

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

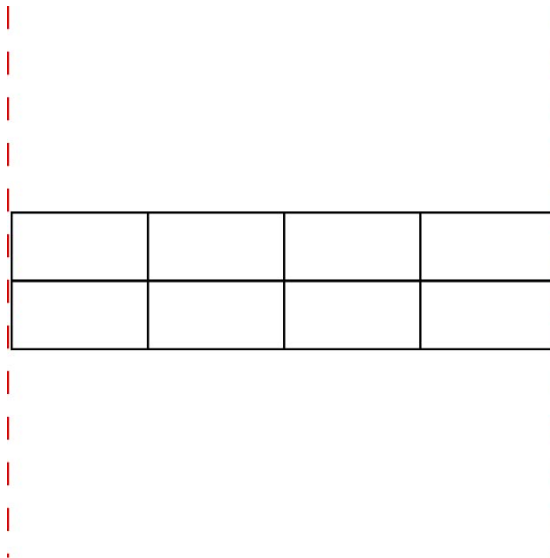
14) Evaluate the following. (The table you filled out earlier in 7) may help.)
Rationalize denominators wherever appropriate. (8 points total)

a) $\cot\left(\frac{2\pi}{3}\right)$ (3 points)

b) $\csc(675^\circ)$ (5 points)

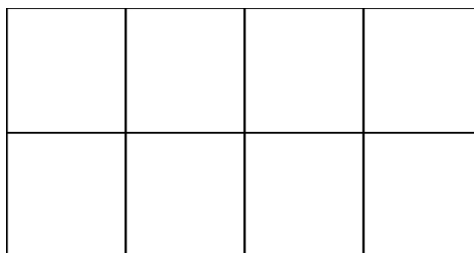
15) Graph one cycle of $y = 2 \tan\left(\frac{1}{3}x\right)$.

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)



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

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)



17) Evaluate the following. (8 points total; 2 points each)

a) $\arccos\left(-\frac{\sqrt{3}}{2}\right)$, which can be written as $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

b) $\arcsin(\pi)$

c) $\sin(\arcsin(-0.7))$

d) $\arctan\left(\tan\left(\frac{3\pi}{4}\right)\right)$

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