

MIDTERM 3 – PART 1

(CHAPTER 4)

INTRODUCTION TO TRIGONOMETRY; MATH 141 – FALL 2022 – KUNIYUKI
150 POINTS TOTAL: 30 FOR PART 1, AND 120 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 (30 PTS.)

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

Write units where appropriate in your final answers.

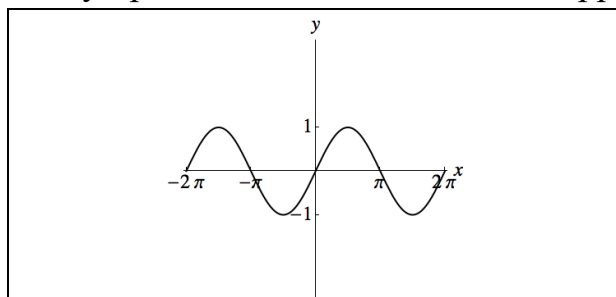
- 1) Give the solutions for $\sin(\theta) = -0.6$, where $0^\circ \leq \theta < 360^\circ$. Give your answers in **degrees** and in solution set form, and round them off to the nearest tenth of a degree (that is, to one decimal place). (5 points)

- 2) Give the solutions for $\tan(\theta) = -2$, 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)

3) 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)

4) Write $\sin\left(\cos^{-1}\left(\frac{x}{2}\right)\right)$, also written as $\sin\left(\arccos\left(\frac{x}{2}\right)\right)$, as an equivalent algebraic expression, as in class. Assume x is in the domain of the expression. (7 points)

5) 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 – FALL 2022 – KUNIYUKI
150 POINTS TOTAL: 30 FOR PART 1, AND 120 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! (120 POINTS)

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

- 6) A central angle of a circle intercepts an arc of length 3 inches along the circle. If the angle’s measure is 7 radians, what is the radius of the circle? (4 points)

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

θ	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$	$\csc(\theta)$
0				
$\frac{\pi}{6}$				
$\frac{\pi}{4}$				
$\frac{\pi}{3}$				
$\frac{\pi}{2}$				
xxx	xxxxxxxxxxx	xxxxxxxxxxx	xxxxxxxxxxx	xxxxxxxxxxx
$\frac{3\pi}{2}$				
$\frac{11\pi}{6}$				

- 8) Convert $\frac{17\pi}{18}$ radians into degrees. (2 points)

- 9) 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
$\sin(x)$		
$\tan(x)$	Use set-builder form.	
$\csc(x)$	Use set-builder form.	
$\sec(x)$	Use set-builder form.	
$\cos^{-1}(x)$		
$\tan^{-1}(x)$		

- 10) Evaluate the following. (A table you filled out earlier may help.)
Rationalize denominators wherever appropriate. (11 points total)

a) $\sec\left(\frac{11\pi}{4}\right)$

b) $\tan(240^\circ)$

c) $\csc(-4\pi)$

11) Write the three Pythagorean Identities, as given in class. Use x as your variable. Hint: Together, these identities involve the squares of the six basic trigonometric functions. (6 points)

12) Which is greater? Box in one: $\tan(40^\circ)$ vs. $\tan(50^\circ)$ (2 points)

13) If $\sin(\theta) = \frac{3}{4}$, find $\csc(-\theta)$. (3 points)

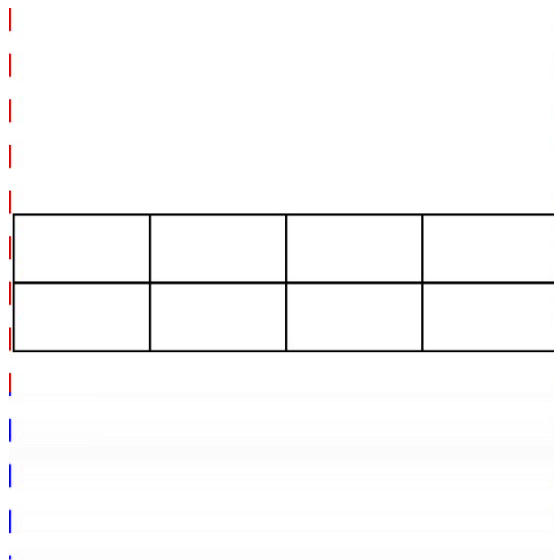
14) The equation $y = 5\cos\left(-3x - \frac{\pi}{2}\right)$ is equivalent to ... (Box in one:). (2 points)

$$y = -5\cos\left(3x + \frac{\pi}{2}\right)$$

$$y = 5\cos\left(3x + \frac{\pi}{2}\right)$$

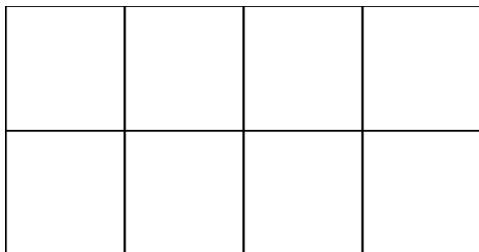
15) Graph one cycle of $y = -3\tan(4x)$.

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 $y = 5 \sin\left(2x + \frac{\pi}{4}\right) + 3$.

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. (6 points total; 2 points each)

a) $\arcsin\left(-\frac{1}{2}\right)$, which can be written as $\sin^{-1}\left(-\frac{1}{2}\right)$

b) $\tan(\arctan(2))$

c) $\arccos\left(\cos\left(\frac{7\pi}{6}\right)\right)$

18) Graph $y = \sin^{-1}(x)$. Draw in the x - and y -axes, and clearly indicate any endpoints and their corresponding coordinates. (6 points)