

Math 42 Midterm 1 Review

You will need a calculator to solve the problems marked ★. Use $\pi \approx 3.14$.

You should **NOT** use a calculator for any other problems.

- [0] Fill out the unit circle handout from my website.
Print out the unit circle trigonometric values “flashcard” handout from my website, and cut into squares.
Randomly select a trigonometric function “flashcard” and an angle “flashcard”.
Identify the position of the angle on the unit circle, the x – and y – coordinates for that position,
and the value of the selected trigonometric function for that angle.
Repeat as many times as necessary to master the unit circle and the associated trigonometric values.
- [1] Find the complements and supplements of each of the following angles. Write your answer in the same units as the given angle.

[a] 104° [b] $\frac{3\pi}{14}$ [c] 1.46 ★ [d] $\frac{3\pi}{5}$ [e] 2.91 ★ [f] 72°

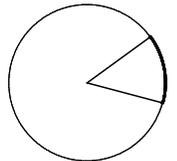
- [2] [i] Find three angles co-terminal with each of the following angles (other than the angle itself).
Write your answer in the same units as the given angle.
One answer should be negative, one answer should be positive and greater than 360° or 2π ,
and one answer should be positive and between 0° and 360° or 0 and 2π .
- [ii] Find the quadrant in which each angle lies.

[a] -45.46 ★ [b] -1045° ★ [c] $\frac{52\pi}{7}$ [d] 27.91 ★ [e] 1347° ★ [f] $-\frac{31\pi}{9}$

- [3] Convert each of the following angles to degrees (if the angle is currently in radians) or radians (if the angle is currently in degrees).

[a] $\frac{7\pi}{15}$ [b] 216° [c] 5.08 ★

- [4] Find the following information regarding central angles (in radians), radii, arc lengths and sector areas of circles.
NOTE: The diagram is **NOT** drawn to scale.



- [a] find the central angle if the sector area is 6 and the radius is 2
[b] find the radius if the arc length is 6 and the central angle is 2
[c] find the arc length if the radius is 6 and the central angle is 2
[d] find the radius if the sector area is 6 and the central angle is 2
[e] find the sector area if the radius is 6 and the central angle is 2
[f] find the central angle if the arc length is 6 and the radius is 2

- [5] Find the following information regarding linear speed and angular speed. ★

- [a] A merry-go-round is spinning at 12 revolutions per minute, and its outer edge has a linear speed of 600 feet per minute.
Find the angular speed and the radius of the merry-go-round.
- [b] The earth is approximately 93 million miles from the sun. Find the linear speed (in miles/hour) and angular speed of the earth in its approximately circular orbit around the sun.
- [c] An athlete is running at 6 miles per hour around a circular road of radius 200 feet. Find the athlete’s angular speed, and how many minutes it takes for them to complete one cycle around the road.
- [d] A vinyl record with a radius of 7 inches was typically played on a turntable that spun around at 45 revolutions per minute.
Find the linear speed (in inches/second) and angular speed of a point on the outer edge of the record.

- [6] Use your calculator to find the following values. ★

[a] $\cot 2$ [b] $\cos(-311^\circ)$ [c] $\tan\frac{7\pi}{9}$ [d] $\csc 114^\circ$ [e] $\sin\frac{10}{3}$ [f] $\sec\frac{2\pi}{11}$

[7] t is a number such that $\sin t = -\frac{7}{25}$ and $\cos t = -\frac{24}{25}$. Find the values of the following expressions using identities.

- [a] $\cos(\frac{\pi}{2} - t)$ [b] $\csc(-t)$ [c] $\cot t$ [d] $\cos(-t)$ [e] $\tan(\frac{\pi}{2} - t)$ [f] $\sin(-t)$
[g] $\sec t$ [h] $\tan(-t)$

[8] θ is an acute angle such that $\csc \theta = 3$. Find the values of the following expressions using a right angle triangle.

- [a] $\sec t$ [b] $\cot t$ [c] $\cos t$ [d] $\tan t$ [e] $\sin t$

[9] Find the values of the following expressions using identities, **not triangles**.

- [a] Find $\tan t$ if $\sec t = -8$ and t is in quadrant 3
[b] Find $\csc t$ if $\cot t = -7$ and $\cos t > 0$
[c] Find $\sec t$ if $\tan t = 8$ and $\sin t < 0$
[d] Find $\cos t$ if $\sin t = -0.8$ and t is between $\frac{3\pi}{2}$ and 2π
[e] Find $\cot t$ if $\csc t = 7$ and $\sec t > 0$

[10] θ is an angle in standard position with the part of the line $5x + 2y = 0$ in quadrant 2 as its terminal side. Find the values of the following expressions.

- [a] $\sin t$ [b] $\sec t$ [c] $\cot t$ [d] $\cos t$ [e] $\tan t$

[11] Solve the following word problems. ★

- [a] You are riding an elevator down the side of a building, to meet your friend who is waiting outside the building. When you stepped on the elevator, the angle of depression to your friend was 86° . After the elevator had descended 28 feet, the angle of depression was then 85° . How high above the ground were you when you first stepped on the elevator, and how far from the base of the elevator was your friend?
- [b] A funicular transports passengers from the foot of a hill to the top along an inclined track. The top of the hill is 734 meters to the west of the foot, and is at an angle of elevation of 37° . How long is the funicular's track, and how much higher is the top of the hill than the base?
- [c] The function $v(t) = 37 - 14\cos 0.0172t$ gives the value (in dollars) of one share of a cyclical stock t days after Jan 1 (during a non-leap year). Find the value of one share of the stock on each of the dates Jan 1, Mar 1, Sep 22.

[12] Find the reference angles for the following angles.

- [a] -131° [b] $-\frac{11\pi}{9}$ [c] -254° [d] $\frac{5\pi}{12}$ [e] 295° [f] $\frac{27\pi}{10}$
[g] $\frac{8\pi}{5}$ [h] 112° [i] $-\frac{5\pi}{7}$ [j] -506° [k] $-\frac{19\pi}{8}$ [l] 411°

[13] Use reference angles and quadrants to find the values of all 6 trigonometric functions of the following angles.

- [a] $\frac{15\pi}{4}$ [b] -300° [c] 495° [d] $-\frac{8\pi}{3}$ [e] 570° [f] $\frac{17\pi}{6}$

[14] Prove the following identities. Use **only** the identities covered so far in this class.

[a] $(\cos t - \sin t)(\cos t + \sin t) = 1 - 2\sin^2 t$

[b] $\frac{\csc \theta}{\cos \theta \tan \theta} - \frac{\cos \theta}{\sin \theta \tan \theta} = 1$

(HINT: Simplify each fraction separately)

[15] Using reference angles and quadrants, find all angles (in radians) that satisfy the following conditions.

[a] $\cos t = -\frac{\sqrt{3}}{2}$

[b] $\tan t = \sqrt{3}$

[c] $\sec t = \sqrt{2}$

[d] $\cot t = -\sqrt{3}$

[e] $\sin t = \frac{1}{2}$

[f] $\csc t = -\frac{2\sqrt{3}}{3}$