MAT 122 Writing Project #1 – Spring, 2022 Name_____
100 Points Covers Chapter 1

This Project is due Friday, February 11th. Projects will be accepted as late as Wednesday, February 16th at a 20% discount.

If you submit this work in hard-copy form, staple this page, with your name on it, as a cover sheet for your project. Write on only one side of each page. I will not award (or deduct) points for anything on the backs of pages. The following instructions apply equally to traditional paper-and-pencil submissions and electronic uploads directly to Assignments on D2L Course Shell.

For early feedback, make a black-and-white, multi-page PDF and upload it to the D2L drop-box for Writing Project #1. Otherwise, mail your neat, clear, black-and-white, one-side-of-each-page work to me at:

Harry Mills
EDBH 134K
Aims Community College
5401 West 20th Street
Greeley, CO 80634

Alternatively, you may just slide it under my office door in Ed Beaty by or before the deadline: EDBH 134K

Mail, E-Mail, or drop off your Writing Project 2 by or before Friday, February 11th. Late work accepted as late as Wednesday, February 16th, at a 20% discount.

1. Do your own work. Show all your work
2. Use plain white paper (or RockeBook) without lines (8 ½ x 11-inch A4 copier paper works just fine). 20% deduction for ruled paper.
3. Staple or paper-clip the top left corner of your project, if you submit hard copy. Do NOT staple over problem numbers or any of your work. If I can't see it, you didn't do it.
4. Leave margins. "MAT 122" in big letters in top left corner of every page solves most problems with margins.
5. Write DARK. I don't mind if you use pen. Just strike through mistakes. Pencil's OK, but make sure you're getting it DARK against a white background. Do not use red ink.
6. Leave ROOM between problems and between steps on your work. I have bad eyes, and I need to make comments on your work, so being stingy with space and paper is a mistake on Writing Projects.
7. **Don't do work in 2 columns!**

Begin Exercises:

1. (5 pts) Find two angles, between -2π and 2π (i.e., between -360^0 and 360^0) that are coterminal with $\frac{35\pi}{6}$. Give exact answers in degrees and radians.

2. Arc Length and Area of Sector. Suppose we have a circle of radius $r = 6$.
   a. (5 pts) Find the arc length on the circle, that is intercepted by an angle of 2344^0. Round to 3 decimal places.
   b. (5 pts) Find the *exact* area of the sector that is intercepted (swept through) by an angle of $\theta = \frac{2\pi}{3}$

3. Answer the questions about the equation $\tan(\theta) = \frac{-2}{3}$.

a. (5 points) Sketch two triangles that satisfy $\tan(\theta) = \frac{-2}{3}$ on the same set of axes.

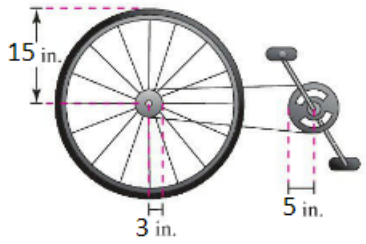
b. (5 pts) Assume the terminal side of the angle θ lies in the 2nd quadrant. Find the other five trigonometric functions of θ.

c. (5 pts) Again, assuming θ's terminal side lies in Q II, and $0 \le \theta < 2\pi$, find θ, in radians *and* degrees, rounded to 3 decimal places.

d. (5 pts) Give *all* solutions to the equation $\tan(\theta) = -\frac{2}{3}$, in degrees *and* radians, rounded to three (3) decimal places.

4. (5 pts) Sketch two periods of the graphs of $y = \sin(x)$ and $y = \csc(x)$ on the same set of coordinate axes. Label all local maxima, minima, and intercepts. Make the interval of your graph symmetric about the *y*-axis.

5. (5 pts) The radii of the pedal sprocket, the wheel sprocket, and the wheel of the bicycle in the figure are 5 inches, 3 inches and 15 inches, respectively. A cyclist is pedaling at a rate of 1.4 revolutions per second. Find the speed of the bicycle in feet per second. Then convert that to miles per hour. Round final answers to 1 decimal place.



6. (5 pts) Sketch the graph of $f(x) = 8\sin\left(\frac{\pi}{14}x - \frac{5\pi}{14}\right) + 13$.

7. (5 pts) Write the cosine function that achieves its maximum height of $y = 7$ centimeters at time $t = 2$ seconds and its minimum height of $y = -4$ centimeters at $t = 30$ seconds.

8. (5 pts) Solve the triangle. That means, find all lengths and angles. Exact answers required.

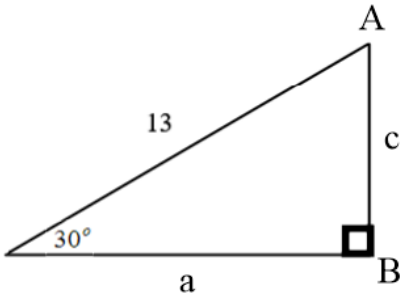


Figure for #8

9. Find the exact value of…

a. … (5 pts) $\tan\left(\arccos\left(\frac{2}{11}\right)\right)$.

b. … (5 pts) $\arccos\left(\sin\left(\frac{7\pi}{4}\right)\right)$

10. (5 pts) Draw the sketch and use it to find an algebraic expression that is equivalent to $\sin(\arccos(3x))$

11. (5 pts) Sketch the pictures corresponding to:

A. $\sin(x) = 0$

B. $\sin(x) = 1$

C. $\sin(x) = \frac{\sqrt{3}}{2}$

D. $\sin(x) = \frac{1}{\sqrt{2}}$

E. $\cos(x) = 0$

Some of these only really have one picture.

2. Sketch…

A. (5 pts) … the graph of $y = \sin(x)$ over the period $[-2\pi, 2\pi]$. Use the line $y = x$ as a guide, when you start out close to the y-axis, to keep your graph from being too steep. This is important for your next sketch. Label highs, lows, x-intercepts, the y-intercept, with ordered pairs, for instance, the point $\left(-\frac{\pi}{2}, -1\right)$ is a key point in the graph, and next to its location on the graph, I expect you to put a $\left(-\frac{\pi}{2}, -1\right)$ label. That's what "ordered-pair labels" means. Next-level labels are to use A, B, C, … labels from left to right, in order, from the graph, and then write the list $A = (-2\pi, 0), B = \left(-\frac{3\pi}{2}, 1\right), \ldots$ in a line or in a column. Finally, put arrow tips on the ends of your x- and y-axes, and put an x label at the end of the positive x-axis and a y label at the end of the positive y-axis. Beauty. Nothing left out.

B. (5 pts) … Re-sketch that part of your sketch in part **A**, restricted in the standard way to make it 1-to-1. Label the endpoints. Again, don't make it too steep! State the domain and range of the restricted sine function. Again, that 45-degree line $y = x$ can help keep your graph honest.

C. (5 pts) … the same graph you did for part **B**, including the line $y = x$, ***very lightly*** on your paper, with or without any labels. Then use those two graphs as guides to sketch $\sin^{-1}(x) = \arcsin(x)$. I want to see the function (lightly) and its inverse (boldly) in the same picture. Label key points as ordered pairs.

D. (5 pts) … State the domain and range of the restricted sine function and the inverse sine function.

3. (5 pts) Sketch the graph of one period of $y = \cos(x)$. Then sketch another graph where you restrict its domain to make it 1-to-1, *and* $y = \arccos(x)$ on the same set of coordinate axes. I want to see the function and its inverse in the same picture. Label key points as ordered pairs (ALWAYS). State the domain and range of the restricted cosine function and its inverse.