MAT 122 Writing Project #2, Spring, 2022 Name__________________
100 Points NO GRAPHING CALCULATORS!!!

Do all your work and submit answers with your work, on separate paper. Organize your work for efficient grading and feedback. Leave a margin, especially in the top left, where the staple goes!

FORMATTING: This is semi-formal writing, here. That means show some professionalism. You don't have to type it out, but you do need to be very clear.

1. Write on only one side of each page. I will not award (or deduct) points for anything on the backs of pages.
2. Plain white paper without lines (8 ½ x 11-inch A4 copier paper works just fine). Paper with lines:
3. Staple top left corner. 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 all problems with margins. We
5. Write DARK. I don't mind if you use pen. Just put a line through mistakes. Pencil's good, but make sure you're getting it DARK, i.e., BLACK, with a white background.
6. Leave ROOM between problems and between steps on your work. I have bad eyes, so being stingy with space and paper is a mistake on Writing Projects. **Don't do work in 2 columns!**

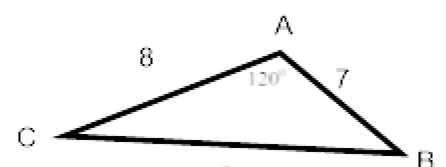
For early feedback, make a black-and-white, multi-page PDF and upload it to the D2L drop-box for Writing Project #3. Otherwise, mail your neat, clear, black-and-white, one-side-of-each-page work to me at:

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

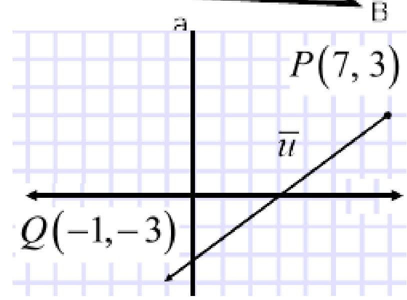
Alternatively, you may just slide it under my office door in Ed Beaty by or before the deadline: EDBH 134K

Mail, E-Mail, or drop off your Writing Project 2 by or before Wednesday, March 30th. Late work accepted as late as Thursday, April 3rd, at a 20% discount.

1. Consider the triangle in the figure. Assume lengths are in centimeters.
   a. (5 pts) Use the Law of Cosines to find the length of side a.
   b. (5 pts) Use the Law of Sines to find angles B and C.

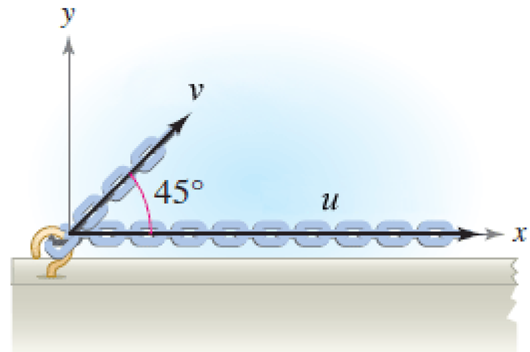


2. Consider the directed line segment $\overrightarrow{PQ}$ in the figure on the right. I want you to provide some basic facts about the vector $\overline{u}$:
   a. (5 pts) Express the vector $\overline{u} = \overrightarrow{PQ}$ in component form.
   b. (5 pts) Compute the magnitude of $\overline{u}$. Leave your answer in simplified radical form.
   c. (5 pts) Find the direction angle of $\overline{u}$. Use degrees, rounded to 4 places.



3. Let $\overline{u} = \langle 4, 5 \rangle$.
   a. (5 pts) Express $\overline{u}$ as a linear combination of the canonical (standard) unit vectors $\overline{i}$ and $\overline{j}$.

b. (5 pts) What's another word for the sum of 2 vectors?



4. Forces with magnitudes $\|\bar{u}\| = 90$ **N** and $\|\bar{v}\| = 25\sqrt{2}$ **N** are acting on a hook, as shown in the figure.
   a. (5 pts) Express $\bar{u}$ and $\bar{v}$ in component form.
   b. (5 pts) Express the resultant force in component form.
   c. (5 pts) Find the direction angle of the resultant force, in degrees, rounded to 4 decimal places.

5. (5 pts) Find the area of the triangle in the 1st problem.

6. A gun with a muzzle velocity of 370 meters per second is fired, with an angle of 15^0 from the horizontal.
   a. (5 pts) Find the horizontal and vertical components of the bullet, as it leaves the muzzle, accurate to 4 decimal places.
   b. (5 pts) Use a half-angle formula to find the *exact* value for the answer to the previous.
   c. (5 pts) Using - 9.8 $\frac{m}{s^2}$ for the acceleration due to gravity, and neglecting air friction, predict where and when the bullet will hit the ground, in the gun question. Round your answer to 2 decimal place
   d. (5 pts) Find $\sin(2u), \cos(2u)$ and $\tan(2u)$, given that $\cos(u) = \frac{2}{5}$ and $\sin(u) < 0$.

Are you smarter than the average bear?

7. (5 pts) Build a cosine function that achieves its maximum height of $y = 62$ meters at time $x = 5$ seconds and its minimum height of $y = -8$ meters at $x = 13$ seconds.

8. (5 pts) Find all solutions of the equation $2\sin^2(3x) - 1 = 0$ in the interval $[0, 2\pi)$. Exact answers in π radians, only.

9. (5 pts) Sketch the graph of $4\sin\left(\frac{2\pi}{7}x - \frac{26\pi}{7}\right) - 11$.

10. The triangle described has 2 possible solutions:
    Angle $A = 30^0$, side $b = 8$ and side $a = 5$.

   a. (5 pts) Prove there are 2 possible triangles from this ambiguous information.
   b. (5 pts) Find both triangles. Round final answers to 3 places.
   c. (5 pts) Use your work to find the area of both triangles. Round final answer to 3 places.