

Show all work.

- 1) (3 pts) Compute all solutions to the equation

$$\sin x = \frac{1}{2}.$$

$$x = \sin^{-1}\left(\frac{1}{2}\right).$$

This gives

$$x = \frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi, \quad n = 0, \pm 1, \pm 2, \dots$$

- 2) (1 pt) Which of the values you obtained in Question 1 is the principle value?

Principle values for the inverse sine function are in the range $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ so the principle value is $\frac{\pi}{6}$.

- 3) (3 pts) Write the complex number $-\sqrt{3} - i$ in polar form.

The length is

$$r = \sqrt{(-\sqrt{3})^2 + (-1)^2} = \sqrt{4} = 2.$$

The angle is

$$\theta = \tan^{-1}\left(\frac{-1}{-\sqrt{3}}\right) = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right) = \frac{\pi}{6},$$

but there is a catch. This angle is in quadrant 1 and the given complex number is in quadrant 3. To get the correct angle, you need to subtract π from $\frac{\pi}{6}$;

$$\theta = \frac{\pi}{6} - \pi = -\frac{5\pi}{6},$$

so

$$-\sqrt{3} - i = 2e^{-\frac{5\pi}{6}}.$$

Remember this problem because we will come back to it later.

- 4) (3 pts) The lines in the figure below are chords of the circle.

- a) Determine the value of x .

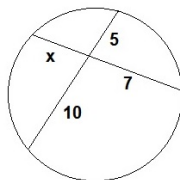
The necessary equation is $7x = 50$, so $x = \frac{50}{7}$.

- b) What is the name of the theorem you used to determine x ?

The intersecting chords theorem.

- c) What fundamental concept in geometry do you suspect would be used in proving the theorem from part b)? Try to answer without looking this up.

The proof uses the fact that the chords form similar triangles. The difficult part is proving that the triangles are similar.



- 5) (2 pts) If there are 23 snoggs in a blimd and 8 blimds in a whozee, how many whozees are there in 15.6 snoggs?

The necessary conversion factor is

$$23 \frac{\text{snogg}}{\text{blimd}} \cdot 8 \frac{\text{blimd}}{\text{whozee}} = 184 \frac{\text{snogg}}{\text{whozee}}.$$

This gives

$$15.6 \text{ snoggs} \cdot \frac{\text{whozee}}{184 \text{ snogg}} \approx 0.0847 \text{ whozees}.$$

- 6) (1 pt) Faculty at the college are paid every other Wednesday. In 2012, something unusual happened. Faculty received 3 paychecks in February.

a) Why is this unusual?

It would require 5 Wednesdays in February to get 3 paychecks and most Februarys only have 4.

b) List all events that needed to align for this to happen.

For this to happen, you need a leap year in which February 1 falls on a payday Wednesday.

- 7) (1 pt) This is a 'how much older than the students is the professor' question.

a) There is a famous urban legend surrounding the song 'Love Rollercoaster' by the Ohio Players. What is this legend?

The scream heard in the song is someone being killed (or electrocuted) in the studio when the song was recorded.

b) Did you already know the answer to this question or did you have to look it up?

- 8) (1 pt) Where is one of the few places you are likely to see a dot matrix printer these days?

Anyplace that prints large volumes of multi-part forms. Airports and auto repair places are the most common locations for this.

- 9) (1 pt) Go to Brockport's website. Open the search box and search for anything you want that will return many results (say, registration). Go to the bottom of the search results page and click on the Next arrow. Then click on any of the page numbers. What happens when you do this? Hover your mouse over the page numbers or the Next arrow. If you look at the bottom of your browser in the status bar, you should see something that looks like a computer command. Based on the behaviors you observed above, what do you think this command does?

Nothing happens when you click these items. The command `javascript:void(0);` tells the browser to 'do nothing.'