

# MAT 115, Midterm 3 $\gamma$

April 23, 2021

Name: \_\_\_\_\_

C# : \_\_\_\_\_

Answer the questions in the spaces provided on the question sheets. Show an appropriate amount of work (including appropriate explanation) for each problem, so that graders can see not only your answer but also how you obtained it. Include units in your answer when possible. You may receive 0 points for a problem where you show no work.

## Instructions:

1. Do not open this exam until told to do so.
2. No books or notes may be used on the exam.
3. Credit or partial credit will be given only when the appropriate explanation and/or algebra is shown.
4. Make sure your answer is clearly marked.
5. Read and follow directions carefully.
6. This exam has 10 questions, for a total of 100 points. There are 8 pages. Make sure you have them all.
7. You will have 50 minutes to complete the exam.
8. All cell phones and electronic devices (other than calculators) must be turned off during the exam.
9. Do not separate the pages of this exam. If they do become separated, write your name on every page and point this out to your instructor when you hand in the exam.
10. You may only use an *approved* calculator on the exam. No calculators with a CAS, QWERTY keyboards, or graphing utilities are allowed.
11. If you use graphs or tables to find an answer, be sure to include an explanation and sketch of the graph, and to write out the entries of the table that you use.

1. [10 points] A population of bacteria is growing in a test tube. The continuous growth rate of the bacteria is 8.3% per hour. If there are initially 250 bacteria in the test tube, how many will there be after 17 hours? *Write your interpretation in a complete sentence with units.*

2. [8 points] Rewrite the following logarithmic equations in exponential form or vice versa.

(a)  $\log .01 = -2$

(b)  $3^4 = 81$

(c)  $10^0 = 1$

(d)  $\log_5 \frac{1}{625} = -4.$

3. [10 points] Expand the following expression and simplify as much as possible:

$$\ln \left( \frac{e^7 x^{-23}}{e^2 y^2} \right)$$

4. [10 points] Buffy deposits \$5,500 in a savings account paying 2.5% interest per year compounded every two months. How long will it take for her to have \$10,000 in the account?

5. [8 points] Convert the following angles from degree to radians or vice versa. Keep your answers in exact form unless otherwise stated.

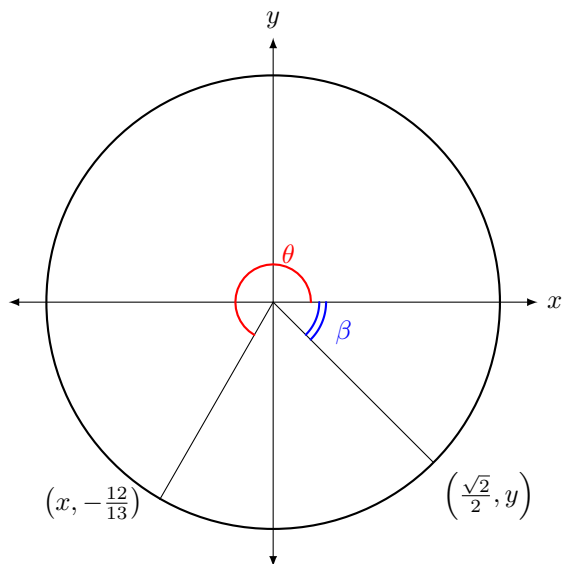
(a)  $585^\circ$

(b)  $\frac{4\pi}{3}$  radians

(c)  $119^\circ$  (Round to nearest thousandth).

(d)  $-4$  radians (Round to nearest thousandth).

6. [16 points] Given the picture of the unit circle below, find the following values:



(a)  $\sin \theta$

(e)  $\sin \beta$

(b)  $\cos \theta$

(f)  $\cos \beta$

(c)  $\tan \theta$

(g)  $\sin(-\beta)$

(d)  $\cos(-\theta)$

(h) The value of  $\beta$  in radians.

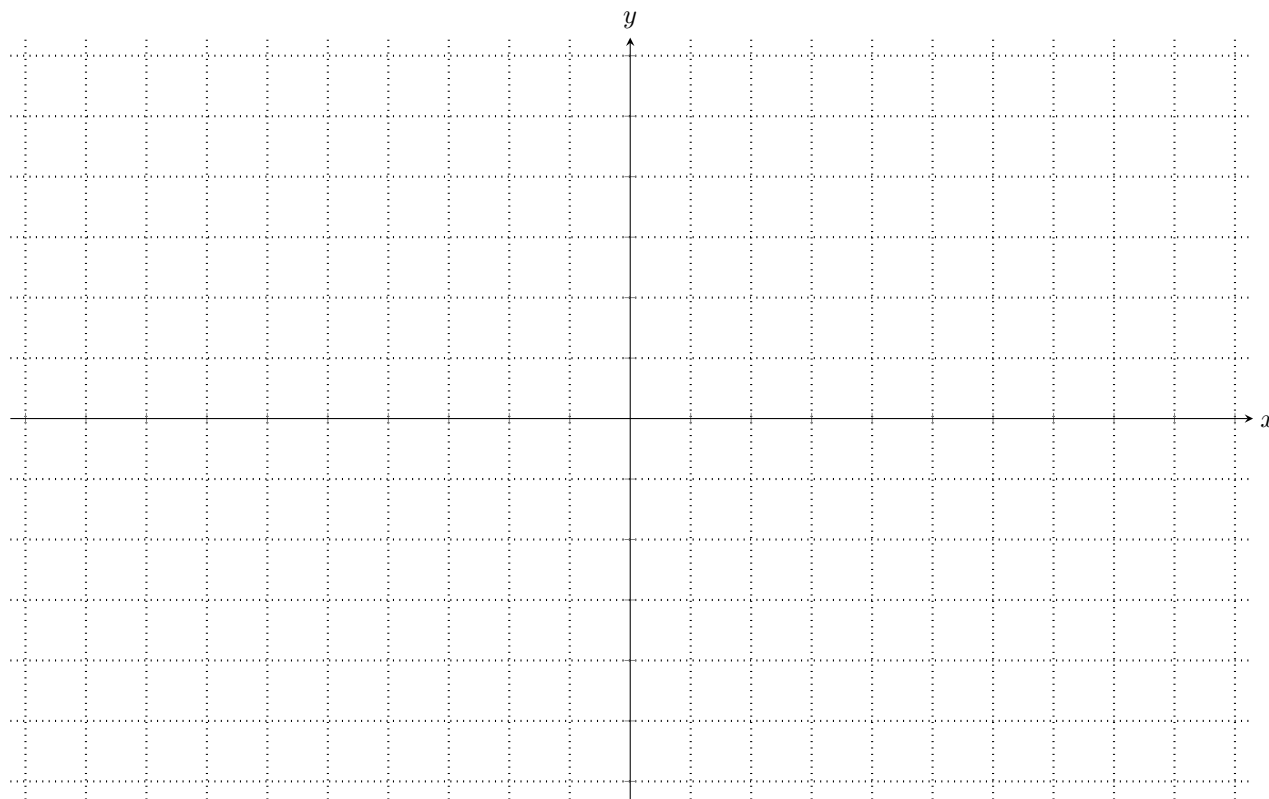
7. [10 points] Consider the sinusoidal function  $f(t) = 3 \sin(\frac{1}{2}t) - 1$ .

(a) What is the midline of the graph of  $f$ ?

(b) What is the amplitude of  $f$ ?

(c) What is the period of  $f$ ?

(d) Sketch a graph of the function below:



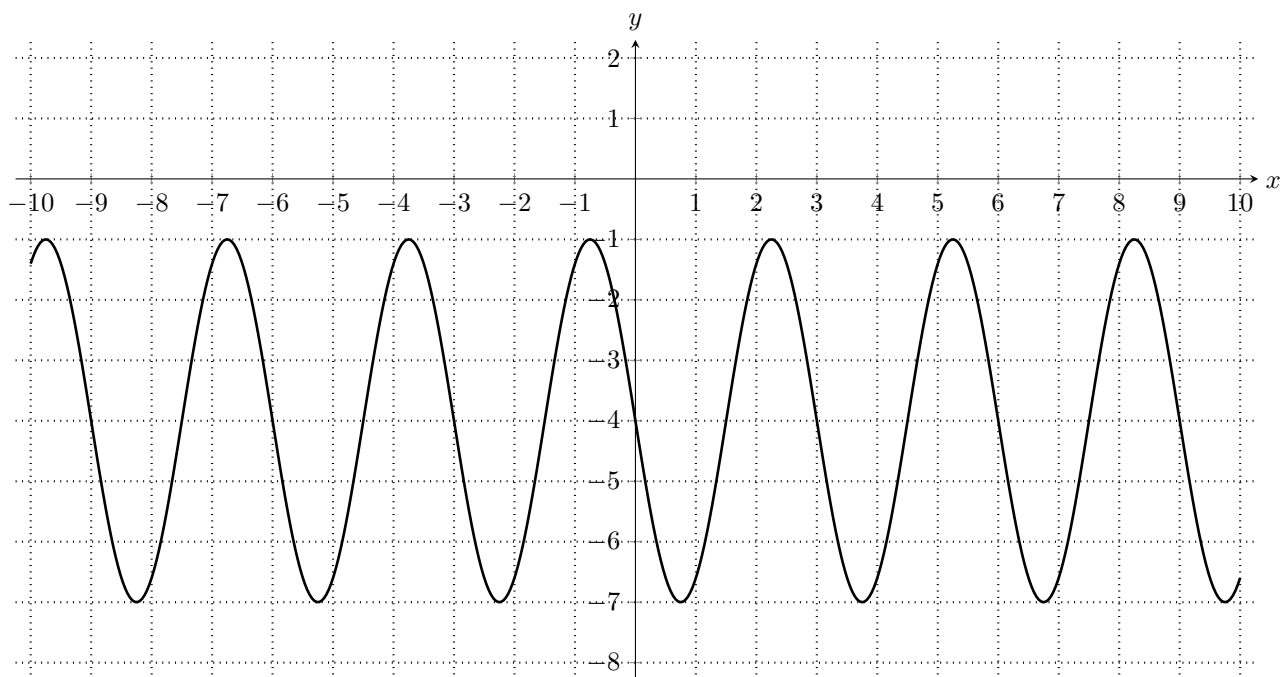
8. [10 points] You find a slice from a circular pie! The outside (crust) edge measures 3.5 inches and the angle between its sides is  $32^\circ$ . What is the diameter of the pie that it came from? *Write your interpretation in a complete sentence with units.*

9. [10 points] Find all solutions **in radians** between 0 and  $2\pi$  to the following equations:

(a)  $9 \cos(x) - 4 = -4$

(b)  $2 \sin(x) - 1 = 0$

10. [8 points] Find a formula for the graph below:





*This unit circle is not for a grade, but is intended to help you on the exam.*

