Math 223 Final Exam, Fall 2022 (Version 1) 17 Oct 2022

Name: _			
Section:			

INSTRUCTIONS: Write clear, careful, neat solutions in the space provided. Write all your work on the test – nothing else will be graded. If you need extra space, use the back of the previous page.

When a computation is required, *show all work necessary to obtain the result*. Your work must be legible, and the *final answers must be reasonably simplified*.

Put away all calculators and cell phones. No books, no notes, no electronic devices (calculators, cell phones, smart watches, etc.).

Please wait for your instructor to tell you to start.

Question	1	2	3	4	5	6	7	8	9	Total
Possible points	15	10	15	5	15	10	10	15	5	100
Your										
score										

1. [15 pts] Compute the values of the following trigonometric functions at the given angles:

(a)
$$\cos\left(-\frac{5\pi}{6}\right)$$

(b)
$$\csc\left(\frac{\pi}{4}\right)$$

(c)
$$\tan\left(\frac{9\pi}{2}\right)$$

2. [10 pts] Expand as a sum or difference of logarithms and simplify as much as possible:

$$\log_3 \frac{\left(x+1\right)\sqrt{x-7}}{9\left(x-4\right)^2}$$

3. [15 pts] Find the exact value of each expression:

(a)
$$\tan^{-1}\left(\sqrt{3}\right)$$

(b)
$$\arcsin(-1)$$

(c)
$$5^{\log_5 9}$$

(d)
$$\ln\left(\frac{1}{e^2}\right)$$

(e)
$$\arcsin\left(\cos\left(-\frac{\pi}{3}\right)\right)$$

4. [5 pts] Rewrite sin(arctan(x)) as an algebraic expression in x.

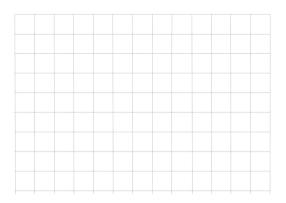
5. [15 pts] Solve each equation:

(a)
$$\ln(x^2-1)=0$$

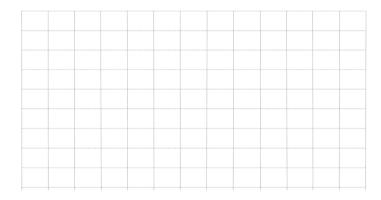
(b)
$$e^{2x-3} = 12$$

(c) $3\sec^2(x)-4=0$ over the interval $[0, 2\pi]$.

- 6. [10 pts] Sketch the graphs of the functions, accurately scaling your axes and labeling any intercepts.
 - (a) $y = \ln(x-1)$

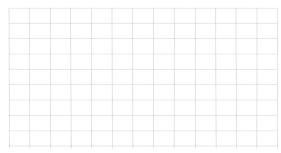


(b) $y = -\frac{1}{3}\sin(x+\pi)$ over the interval $[-\pi, \pi]$.



7. [15 points] Sketch the piecewise function and answer the questions about it.

$$f(x) = \begin{cases} x^2 - 1, & \text{if } x < 0 \\ 2, & \text{if } 0 \le x < 1 \\ \sqrt{x + 3}, & \text{if } x > 1 \end{cases}$$



(a) $\lim_{x \to -3} f(x) =$

(d) $\lim_{x \to 1^{-}} f(x) =$

(b) $\lim_{x \to 0} f(x) =$

(e) $\lim_{x \to 1^+} f(x) =$

(c) $f\left(\frac{2}{3}\right) =$

(f) f(1) =

8. [15 pts] Compute the following limits:

(a)
$$\lim_{x \to 4} \frac{16 - x^2}{x - 4} =$$

(b)
$$\lim_{x \to 1^{-}} \frac{|x-1|}{x^2 - 1}$$

(c)
$$\lim_{h \to 0} = \frac{\sqrt{25 + h} - 5}{h}$$

9. [5 pts] Circle the correct response and give a brief reason for your choice:

(a)
$$f(x) = \begin{cases} \cos(x), & \text{if } x < 0 \\ 1, & \text{if } 0 \le x < \frac{\pi}{4} \\ \sin(x), & \text{if } x \ge \frac{\pi}{4} \end{cases}$$

is (continuous / discontinuous) at x = 0 because______,

and it is (continuous / discontinuous) at $x = \frac{\pi}{4}$ because ______.