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

Name:

Section:

score

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.).

Total

100

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

Please wait for your instructor to tell you to start.

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:

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

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

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 ______.