



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

(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.

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



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

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

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

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

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

(f)  $f(1) =$

8. [15 pts] Compute the following limits:

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

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

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

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

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

is (continuous / discontinuous) at  $x = 0$  because \_\_\_\_\_,

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