Math 126, Fall 2019, USC Instructor: Steven Heilman

Name: _____ USC ID: _____ Date: _____

Signature: _____. Discussion Section: _____
(By signing here, I certify that I have taken this test while refraining from cheating.)

Exam 1

This exam contains 7 pages (including this cover page) and 5 problems. Enter all requested information on the top of this page.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- You have 50 minutes to complete the exam, starting at the beginning of class.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; clearly indicate when you have done this. Scratch paper appears at the end of the document.

Problem	Points	Score
1	10	
2	15	
3	10	
4	10	
5	10	
Total:	55	

Do not write in the table to the right. Good luck![a]

[a] September 24, 2019,

1. Label the following statements as TRUE or FALSE. You do not need to explain your answer. No partial credit will be given in this section.

(a) (2 points) Let x be a real number. Then $\cos^{-1}(\cos(x)) = x$.

TRUE FALSE (circle one)

(b) (2 points) Consider $f(x) = x^2$ with domain $[-1, 1]$. Then f has an inverse function.

TRUE FALSE (circle one)

(c) (2 points) Let f be a function of a real variable with inverse g. If x is in the domain of g and if $f'(g(x)) \neq 0$, then $g'(x) = \dfrac{1}{f'(g(x))}$.

TRUE FALSE (circle one)

(d) (2 points) Let $f(x) = e^x$ with domain $(-\infty, \infty)$. Then the inverse of f is the function $\ln(x)$ with domain $(0, \infty)$.

TRUE FALSE (circle one)

(e) (2 points) Let $\sin^{-1}(x)$ denote the inverse sine of x. Let $-1 < x < 1$. Then

$$\cos(\sin^{-1}(x)) = \sqrt{1 - x^2}$$

TRUE FALSE (circle one)

2. Compute the following limits.

(a) (5 points) $\lim_{x \to 0^+} \dfrac{\cos(x) - 1}{x^2}$.

(b) (5 points) $\lim_{x \to 0} \dfrac{x + 2}{x + 1}$.

(c) (5 points) $\lim_{x \to \infty} \tan^{-1}(x)$. (As usual, $\tan^{-1}$ denotes the inverse of the tangent function.)

3. Evaluate the following integrals.

(a) (5 points) $\int x \ln(x)\, dx.$

(b) (5 points) $\int_4^5 \frac{1}{t \ln t}\, dt.$

4. Evaluate the following integrals.

(a) (5 points) $\displaystyle\int_0^{\pi/2} \cos^5(x)\,dx.$

(b) (5 points) $\displaystyle\int \frac{t}{t^2-3t+2}\,dt.$

5. (10 points) Evaluate the following integral.

$$\int_{\sqrt{2/3}}^{\sqrt{2}} x^{-4}\sqrt{2+x^2}\,dx.$$

(Scratch paper)