Last Name: ______________________  First Name: ______________________

Directions:

• The use of a calculator, cell phone, laptop or computer is prohibited.
• TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
• Answer all of the questions, and present your solutions in the space provided. Show all your work neatly and concisely and clearly indicate your final answer. You will be graded not merely on the final answer, but on the quality and correctness of the work leading up to it.

The UC Davis Code of Academic Conduct

I will conduct myself with honesty, fairness, and integrity.

Signature: __________________________________________
(1) Find the total area of the bounded region(s) between the following curves. (10 points)

\[ f(x) = x, \quad g(x) = \sin(x), \quad \text{and} \quad x = \frac{\pi}{2} \]

(2) Evaluate each of the following integrals. (8 points each)

(a) \[ \int x \sqrt{x^2 + 5} \, dx \]
(b) \[ \int \frac{\ln(x)}{x^3} \, dx \]

(c) \[ \int \frac{\cos(2x)}{(7 + \sin(2x))^2} \, dx \]

(d) \[ \int \frac{\sec(x) \tan(x)}{\cot(x) \cos(x)} \, dx \]
(e) \[ \int \sec^4(x) \tan(x) \, dx \]

(f) \[ \int \frac{4x + 6}{e^{2x}} \, dx \]

(g) \[ \int \frac{x^3 + 1}{x - 1} \, dx \]
(3) Evaluate each of the following integrals. (8 points each)

(a) \[ \int_{0}^{\ln 3} \frac{e^x}{5 + e^x} \, dx \]

(b) \[ \int_{e}^{\infty} \frac{1}{x \ln(x)} \, dx \]

(c) \[ \int_{-\infty}^{\infty} x^3 e^{-x^4} \, dx \]
(4) Evaluate the following integral. (10 points)
\[ \int \frac{x}{(x^2 - 4)(x + 2)} \, dx \]
(Bonus) Evaluate each of the following integrals using the integration methods we have covered in class, i.e. without using the attached formula sheet. (2 points each)

(a) \[ \int \csc(x) \, dx \]

(b) \[ \int_{1}^{\infty} \frac{1}{x^3 + 1} \, dx \]
Trigonometric Identities

\[
\begin{align*}
\sin(A + B) &= \sin(A) \cos(B) + \cos(A) \sin(B) \\
\sin(A - B) &= \sin(A) \cos(B) - \cos(A) \sin(B) \\
\cos(A + B) &= \cos(A) \cos(B) - \sin(A) \sin(B) \\
\cos(A - B) &= \cos(A) \cos(B) + \sin(A) \sin(B) \\
\sin(2A) &= 2 \sin(A) \cos(A) \\
\cos(2A) &= \cos^2(A) - \sin^2(A)
\end{align*}
\]

\[
\begin{align*}
\sin^2(A) + \cos^2(A) &= 1 \\
\tan^2(A) + 1 &= \sec^2(x) \\
1 + \cot^2(A) &= \csc^2(x)
\end{align*}
\]

\[
\int \sec(x) \, dx = \ln |\sec(x) + \tan(x)| + C
\]

\[
\int \csc(x) \, dx = -\ln |\csc(x) + \cot(x)| + C
\]

Error Estimates

\[
|E_T| \leq \frac{M(b-a)^3}{12n^2} \quad f''(x) \leq M \text{ for all } x \in [a, b]
\]