Math 16B, Section 3 - Winter 2018
Instructor: Christopher O’Neill
Practice Exam 3, Version 1

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 between the following curves.

\[ f(x) = x^3 - x^2 + 1 \quad \text{and} \quad g(x) = x^3 - 2x^2 + x + 3 \]

(2) Evaluate each of the following integrals.

(a) \[ \int \frac{1}{\cos^2(x) \cot(x) \sec(x)} \, dx \]
(b) \[ \int \frac{1}{x \ln(x^2)} \, dx \]

(c) \[ \int x \ln(2x + 1) \, dx \]

(d) \[ \int e^{3x} \sqrt{5 + e^{3x}} \, dx \]
(e) \[ \int \frac{2 - \cos(x) + \sin(x)}{\cos^2(x)} \, dx \]

(f) \[ \int \tan^3(x) \, dx \]

(g) \[ \int \frac{4x + 2}{x^2 + x} \, dx \]
(3) Evaluate each of the following integrals.

(a) \( \int_{0}^{\pi/4} \sec^2(x) \tan(x) \, dx \)

(b) \( \int_{0}^{\infty} \frac{1}{(3x + 2)^4} \, dx \)

(c) \( \int_{-\infty}^{\infty} \frac{x^3}{x^4 + 1} \, dx \)
(4) Evaluate the following integral.

\[ \int \frac{x^3 + 1}{x^3 + 3x^2} \, dx \]
Trigonometric Identities

\[ \sin(A + B) = \sin(A) \cos(B) + \cos(A) \sin(B) \]
\[ \sin(A - B) = \sin(A) \cos(B) - \cos(A) \sin(B) \]
\[ \cos(A + B) = \cos(A) \cos(B) - \sin(A) \sin(B) \]
\[ \cos(A - B) = \cos(A) \cos(B) + \sin(A) \sin(B) \]
\[ \sin(2A) = 2 \sin(A) \cos(A) \]
\[ \cos(2A) = \cos^2(A) - \sin^2(A) \]
\[ \sin^2(A) + \cos^2(A) = 1 \]
\[ \tan^2(x) + 1 = \sec^2(x) \]
\[ 1 + \cot^2(A) = \csc^2(x) \]

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

Error Estimates

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