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.

$$f(x) = x^3 - x^2 + 1 \qquad \text{and} \qquad g(x) = x^3 - 2x^2 + x + 3$$

(2) Evaluate each of the following integrals.

(a) $\displaystyle\int \frac{1}{\cos^2(x)\cot(x)\sec(x)}\,dx$

(b) $\displaystyle\int \frac{1}{x\ln(x^2)}\ dx$

(c) $\displaystyle\int x\ln(2x+1)\ dx$

(d) $\displaystyle\int e^{3x}\sqrt{5+e^{3x}}\ dx$

(e) $\displaystyle\int \frac{2-\cos(x)+\sin(x)}{\cos^2(x)}\ dx$

(f) $\displaystyle\int \tan^3(x)\ dx$

(g) $\displaystyle\int \frac{4x+2}{x^2+x}\ dx$

(3) Evaluate each of the following integrals.

(a) $\displaystyle\int_0^{\pi/4} \sec^2(x)\tan(x)\ dx$

(b) $\displaystyle\int_0^{\infty} \frac{1}{(3x+2)^4}\ dx$

(c) $\displaystyle\int_{-\infty}^{\infty} \frac{x^3}{x^4+1}\ dx$

(4) Evaluate the following integral.

$$\int \frac{x^3+1}{x^3+3x^2}\,dx$$

Trigonometric Identities

$$\begin{aligned}
\sin(A+B) &= \sin(A)\cos(B)+\cos(A)\sin(B)\\
\sin(A-B) &= \sin(A)\cos(B)-\cos(A)\sin(B)\\
\cos(A+B) &= \cos(A)\cos(B)-\sin(A)\sin(B)\\
\cos(A-B) &= \cos(A)\cos(B)+\sin(A)\sin(B)
\end{aligned}$$

$$\begin{aligned}
\sin(2A) &= 2\sin(A)\cos(A)\\
\cos(2A) &= \cos^2(A)-\sin^2(A)
\end{aligned}$$

$$\sin^2(A)+\cos^2(A)=1$$

$$\tan^2(A)+1=\sec^2(x)$$

$$1+\cot^2(A)=\csc^2(x)$$

$$\begin{aligned}
\int \sec(x)\ dx &= \ln|\sec(x)+\tan(x)|+C\\
\int \csc(x)\ dx &= -\ln|\csc(x)+\cot(x)|+C
\end{aligned}$$

Error Estimates

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