Math 16B, Section 3 - Winter 2018
Instructor: Christopher O'Neill
Practice Exam 3, Version 2

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)

$$f(x) = x, \qquad g(x) = \sin(x), \qquad \text{and} \qquad x = \frac{\pi}{2}$$

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

(a) $\int x\sqrt{x^2+5}\, dx$

(b) $\displaystyle\int \frac{\ln(x)}{x^3}\ dx$

(c) $\displaystyle\int \frac{\cos(2x)}{(7+\sin(2x))^2}\ dx$

(d) $\displaystyle\int \frac{\sec(x)\tan(x)}{\cot(x)\cos(x)}\ dx$

(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) $\displaystyle\int_0^{\ln 3} \frac{e^x}{5+e^x}\,dx$

(b) $\displaystyle\int_e^{\infty} \frac{1}{x\ln(x)}\,dx$

(c) $\displaystyle\int_{-\infty}^{\infty} x^3 e^{-x^4}\,dx$

(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

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

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

$$\begin{aligned}
\sin^2(A)+\cos^2(A) &= 1\\
\tan^2(A)+1 &= \sec^2(x)\\
1+\cot^2(A) &= \csc^2(x)
\end{aligned}$$

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

Error Estimates

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