Math 16B: Short Calculus II
Spring 2017, Section 1
Homework Sheet 5
Due: Friday, May 12, 2017

Submit your solutions to the following problems in lecture on the due date above. Present your work in a clean and organized fashion, either on a printed copy of this document (preferred) or a separate sheet of paper. As stated in the syllabus, late submissions will **not** be accepted.

1. Evaluate the following integrals using U-substitution.

(a) $\int \cos(x)e^{\sin(x)}\,dx$

$= \int e^u du = e^u + C$

let $u = \sin(x)$

$\frac{du}{dx} = \cos(x)$

$du = \cos(x)\,dx$

$= \boxed{e^{\sin(x)} + C}$

(b) $\int x^2 \sin(x^3+3)\,dx$

$= \int \frac{1}{3}\sin(u)\,du = -\frac{1}{3}\cos(u) + C$

let $u = x^3+3$

$\frac{du}{dx} = 3x^2$

$\frac{1}{3}du = x^2 dx$

$= \boxed{-\frac{1}{3}\cos(x^3+3) + C}$

(c) $\int \frac{x^2+3}{\sqrt[3]{x^3+9x}}\,dx$

$= \int \frac{1/3}{\sqrt[3]{u}}\,du = \int \frac{1}{3}u^{-1/3}\,du$

let $u = x^3+9x$

$\frac{du}{dx} = 3x^2+9$

$\frac{1}{3}du = (x^2+3)\,dx$

$= \frac{1}{3}\left(\frac{3}{2}u^{2/3}\right) + C$

$= \boxed{\frac{1}{2}(x^3+9x)^{2/3} + C}$

(d) $\int_{\pi/4}^{\pi/2} \cot(x)\,dx$

$= \int_{\pi/4}^{\pi/2} \frac{\cos(x)}{\sin(x)}\,dx = \int_{x=\pi/4}^{x=\pi/2} \frac{1}{u}\,du = \ln|u| \Big|_{x=\pi/4}^{x=\pi/2}$

Let $u = \sin(x)$

$\frac{du}{dx} = \cos(x)$

$du = \cos(x)\,dx$

$= \ln|\sin(x)| \Big|_{x=\pi/4}^{x=\pi/2}$

$= \ln|\sin(\pi/2)| - \ln|\sin(\pi/4)|$

$= \boxed{0 - \ln(\sqrt{2}/2)}$