MATH 134 – Calculus with Fundamentals 2
Practice Day on u-substitution
February 7, 2018

Background

Recall that u-substitution is the name given to the indefinite integration method coming from the Chain Rule for derivatives. In its most basic form, it just says

$$\int f(u(x)) \frac{du}{dx}\ dx = F(u(x)) + C$$

if F is an antiderivative of f. The most important aspects to master here are

- recognizing good candidates for the u to substitute for

- always remembering to compute $du = \frac{du}{dx}\ dx$ and to match that with the rest of the integral other than the $f(u)$ part,

- using the other basic derivative rules to find F from f.

Questions

For each problem,

(i) find a candidate u,

(ii) compute $du = \frac{du}{dx}\ dx$

(iii) see whether the rest of the integrand can be matched with du, possibly up to a constant multiple (if not, then you might need to try a different u),

(iv) finish the integration.

1. $\int x^2 \cos(x^3)\ dx$

2. $\int (\sqrt{x} + 1)^4 \cdot \frac{1}{\sqrt{x}}\ dx$

3. $\displaystyle\int \frac{x+4}{x^2+8x+9}\,dx$

4. $\displaystyle\int e^{\tan(x)}\sec^2(x)\,dx$

5. $\displaystyle\int \frac{x}{\sqrt{1-x^4}}\,dx$