SOLUTIONS

Math 251: Integration Basics Worksheet **23 April 2019**

Fill-in these indefinite integrals you (should) already know:

- $\int x^n\,dx =$ $\frac{x^{n+1}}{n+1}+C$ $(n\neq -1)$
- $\int \sin x\,dx =$ $-\cos x+C$
- $\int \cos x\,dx =$ $\sin x+C$
- $\int \sec^2 x\,dx =$ $\tan x+C$
- $\int \sec x\tan x\,dx =$ $\sec x+C$
- $\int \csc^2 x\,dx =$ $-\cot x+C$
- $\int \frac{1}{x}\,dx =$ $\ln|x|+C$
- $\int e^x\,dx =$ e^x+C
- $\int a^x\,dx =$ $\frac{a^x}{\ln a}+C$
- $\int \frac{1}{\sqrt{1-x^2}}\,dx =$ $\arcsin x+C$
- $\int \frac{1}{1+x^2}\,dx =$ $\arctan x+C$
- $\int \csc x\cot x\,dx =$ $-\csc x+C$

- **Question 1:** How do you check your answers when computing integrals? For example, suppose $\int f(x)dx = F(x)+C$. How do you know you are right?

Check by calculating $F'(x)$. You are right if $F'(x)=f(x)$.

- **Question 2:** For what value of n does the reverse power rule for the antiderivative of x^n not apply? What is the antiderivative of x^n for this value of n?

The reverse power rule does not work if $n=-1$.
In that case: $\int x^{-1}dx = \ln|x|+C$

- **Question 3:** What is the u-substitution to use for the following integral?:

$$\int f(g(x))\,g'(x)\,dx =$$ $\int f(u)\,du$

$u=g(x)$

- **Question 4:** When you check an indefinite integral which you did by substitution, what derivative rule will you always use?

You always use the chain rule to check an integral you did by substitution.