MATH 210: 11-29 WORKSHEET

Recall how to do integration by substitution (also called change of variables):

$$\int f(u(x)) \cdot u'(x)\,\mathrm{d}x = \int f(u)\,\mathrm{d}u.$$

The substitution to change the variables is:

$$u = u(x) \qquad \mathrm{d}u = u'(x)\,\mathrm{d}x.$$

(1) Calculate $\int 2x(x^2+1)^2\,\mathrm{d}x$ by using substitution.

(2) Calculate $\int 2x(x^2+1)^2\,\mathrm{d}x$ by first expanding out the multiplication of the terms into a polynomial, then using the power rule. Which method do you prefer?

(3) Calculate $\int \sqrt{\ln x + 4} \cdot \dfrac{1}{x}\,\mathrm{d}x$.

(4) Calculate $\int \dfrac{\sin(\sqrt{x})}{\sqrt{x}}\,\mathrm{d}x$.

(5) Calculate $\int \sec u \tan u \cdot \tan^4 u\,\mathrm{d}u$.

(6) Calculate $\int \csc^2 x \cot x\,\mathrm{d}x$.

(7) Why can't you use integration by parts to integrate $\int e^{-x^2}\,\mathrm{d}x$?

(8) Why can't you use integration by parts to integrate $\int x^2 e^{x^2}\,\mathrm{d}x$?