MATH 210: 12-1 WORKSHEET

Recall how to use integration by substitution to compute a definite integral:

$$\int_a^b f(u(x))u'(x)\,\mathrm{d}x = \int_{u(a)}^{u(b)} f(u)\,\mathrm{d}u.$$

Alternatively, rather than computing new limits of integration for the u-integral, you can keep the limits for x, but translate your antiderivative to the x-domain before plugging in the values.

(1) Calculate $\displaystyle\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}}\,\mathrm{d}x$ by translating to the u-domain with new limits in the u-domain.

(2) Calculate $\displaystyle\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}}\,\mathrm{d}x$ by keeping the limits of integration in the x-domain. Which method do you prefer?

(3) What is $\displaystyle\int_0^1 xe^{2x^2-1}\,\mathrm{d}x$?

(4) Use a computer tool to graph the curve $f(x) = x(1-x^2)^3$. Calculate the area of the region bounded by this curve and the x-axis where x goes from 0 to 1.

(5) What is $\displaystyle\int_0^{\pi/3} \cos x \sin^3 x\,\mathrm{d}x$?