Activity 8.6^{†‡} – Integration by Substitution

FOR DISCUSSION: In your own words, describe the two methods for u-substitution.

1. Evaluate each indefinite integral by using an appropriate u-substitution. Be sure to explicitly write down u and du.

(a)
$$\int e^{4x+5} dx =$$
$$u =$$
$$du =$$
(b)
$$\int x^2 e^{x^3} dx =$$

(c)
$$\int \frac{1}{9t+4} dt =$$

[†] This activity is referenced in Lesson 8.6.

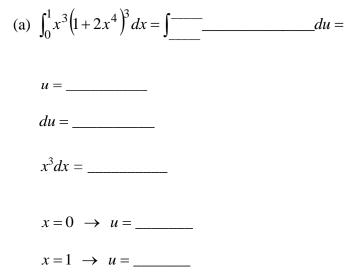
[‡] This activity has supplemental exercises.

(d)
$$\int \frac{x+6}{x^2+12x+10} dx =$$

(e) $\int \sin^5 \theta \, \cos \theta \, d\theta =$

2. Practice "Method 1" for *u*-substitution of definite integrals. That is, change the limits of integration from *x*-limits to *u*-limits. Then use the FTC to evaluate the integral in terms of u.

(plug *u*-limits into antiderivative)



(b)
$$\int_{1}^{2} x \cdot \sqrt[3]{5 - x^2} dx$$

(Follow the procedure shown in Part (a).)

(c)
$$\int_0^{\pi/4} e^{\sin 2x} \cos 2x \, dx$$

3. Practice "Method 2" for *u*-substitution of definite integrals. That is, first evaluate the indefinite integral using *u*-substitution to get the antiderivative in terms of x. Then use the FTC to evaluate the integral in terms of x.

(a)
$$\int_0^1 \frac{3x^7}{(x^8 + 1)^2} dx$$
 $u = _______ du = _______$

(find the antiderivative in terms of *x*)

$$\int \frac{3x^{7}}{(x^{8}+1)^{2}} dx = \int \underline{du} = du$$

(use your antiderivative from above and plug in *x*-limits)

$$\int_0^1 \frac{3x^7}{\left(x^8 + 1\right)^2} \, dx =$$

(b)
$$\int_{1}^{3} \frac{(\ln x)^{2}}{x} dx$$

(Follow the procedure shown in Part (a).)