Calculus 1 Integration by Substitution Assignment

1. Find each indefinite integral.

(a) $\displaystyle\int \sin x \cos x \, dx$.

(b) $\displaystyle\int \cos(ax) \, dx$ where $a \neq 0$.

(c) $\displaystyle\int \frac{x}{(1-x^2)^5} \, dx$

(d) $\displaystyle\int \sec(3-x)\tan(3-x) \, dx$

(e) $\displaystyle\int (x+1)\sqrt{2-x} \, dx$.

(f) $\displaystyle\int \frac{\sin x}{\cos^5 x} \, dx$.

(g) $\displaystyle\int \left(1 + \frac{1}{y}\right)\left(\frac{1}{y^2}\right) \, dy$.

(h) $\displaystyle\int \frac{dx}{\sqrt{1-x^2}}$. Hint: Make the substitution $x = \sin u$.

(i) $\displaystyle\int \frac{dx}{1+x^2}$. Hint: Make the substitution $x = \tan u$.

The formulas in (h) and (i) will be studied right at the beginning of Calculus II.

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1. (a) If you let $u = \cos(x)$ the answer is $-\dfrac{1}{2}\cos^2(x) + C$. There are other ways to do this problem. For example you could let $u = \sin(x)$.

1. (b) $\dfrac{1}{a}\sin(ax) + C$

1. (c) $\dfrac{1}{8(x^2 - 1)^4} + C$

1. (d) $-\sec(3 - x) + C$

1. (e) $-\dfrac{2}{5}x(2 - x)^{\frac{3}{2}} - \dfrac{6}{5}(2 - x)^{\frac{3}{2}} + C$

1. (f) $\dfrac{1}{4}\sec^4(x) + C$

1. (g) $-\dfrac{1}{2y^2} - \dfrac{1}{y} + C$

1. (h) Make the substitution $x = \sin u$. The answer is $\arcsin u + C$

1. (i) Make the substitution $x = \tan u$. The answer is $\arctan u + C$