Practice Assessment 3

Integration via Substitution

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

1. Calculate each of the following **indefinite** integrals by using the Substitution Rule. Your final answer should be in terms of the given variable, not u, and don't forget your "$+C$ ".

   (a) $\displaystyle\int \sin^2\theta\cos\theta\,d\theta$

   (b) $\displaystyle\int 15x^2\sqrt{x^3+1}\,dx$

   (c) $\displaystyle\int \frac{1}{2\sqrt{x}(x+1)}\,dx$, Hint: Rewrite x as $(\sqrt{x})^2$.

   (d) $\displaystyle\int \sec^2(3t-1)\,dt$

(Problem 1 Continued.)

(e) $\displaystyle\int \frac{1}{x(\ln(x))^2}\,dx$

(f) $\displaystyle\int x^2 e^{-x^3}\,dx$

(g) $\displaystyle\int \frac{\ln(\sin(x))}{\tan(x)}\,dx$

(h) $\displaystyle\int \cos(x)e^{\sin(x)}\,dx$

2. Calculate each of the following **definite** integrals by using the Substitution Rule. When you rewrite in terms of u do not forget to appropriately change the bounds of integration.

(a) $\int_0^1 (3x-1)^{50} dx$

(b) $\int_0^{\pi/6} \frac{\sin t}{\cos^2 t}\, dt$

(c) $\int_0^{\pi/3} \frac{\sin t - \cos(t)}{\sin t + \cos(t)}\, dt$

(d) $\int_0^1 \frac{y-1}{y+1}\, dy$

3. Calculate each of the following integrals, which result in inverse trigonometric functions.

(a) $\displaystyle\int \frac{1}{\sqrt{1-16x^2}}\,dx$

(b) $\displaystyle\int \frac{1}{25+16x^2}\,dx$

(c) $\displaystyle\int \frac{e^t}{1+e^{2t}}\,dt$