Rutgers University
Math 151

Sections 5.5-6: Substitution Method - Worksheet

1. Evaluate the following integrals.

(a) $\int (3x^4 + 6)\sec(x^5 + 10x)dx$

(b) $\int \dfrac{dx}{x\sqrt{3\ln(x) + 5}}$

(c) $\int x^2\sqrt{x-1}\,dx$

(d) $\int x^3 \sin(x^4 + 2)dx$

(e) $\int_0^1 \dfrac{x^3}{\sqrt{3+x^2}}dx$

(f) $\int t\sec^2\left(3t^2\right)e^{7\tan\left(3t^2\right)}dt$

(g) $\int e^x(e^x - 2)^{2/3}dx$

(h) $\int e^{2x}(e^x - 2)^{2/3}dx$

(i) $\int_{e^3}^{e^6} \dfrac{dt}{t\ln(t)}$

(j) $\int \dfrac{dx}{5x + 4\sqrt{x}}$

(k) $\int \dfrac{dx}{\sqrt{2-x^2}}$

(l) $\int_0^1 \dfrac{xdx}{\sqrt{2-x^2}}$

(m) $\int_0^{2/3} \dfrac{dz}{4 + 9z^2}$

(n) $\int \dfrac{e^{4\arcsin(5x)}}{\sqrt{1-25x^2}}dx.$

(o) $\int_0^{\pi/10} \dfrac{\sin^3(5x)}{\cos(5x) + 3}dx.$

(p) $\int \dfrac{\left(\tan^{-1}(t)\right)^3}{1+t^2}dt.$

(q) $\int_e^{e^2} \dfrac{dx}{x\sqrt{\ln(x)}}dx.$

(r) $\int \dfrac{\tan(3\ln(x))}{x}dx.$

(s) $\int \dfrac{x^3 + 1}{9 + x^2}dx.$

(t) $\int_0^{\pi/12} \tan^2(3\theta)\sec^2(3\theta)d\theta.$

(u) $\int \dfrac{e^{3x}}{\sqrt{49 - e^{6x}}}dx.$

(v) $\int_{-5/2}^{5/2} \dfrac{1 + \sin(x)}{4x^2 + 25}dx.$

2. Suppose that f is an **even** function such that

$$\int_{-9}^5 f(x)dx = -13 \text{ and } \int_0^9 f(x)dx = 4.$$

Evaluate the definite integrals below.

(a) $\int_{-9}^9 f(x)dx$

(b) $\int_0^5 (4x - 3f(x))dx$

(c) $\int_{-3}^3 xf(x)dx$

(d) $\int_0^3 xf(x^2)dx$

3. Find the average value of the following functions on the given interval.

(a) $f(x) = \dfrac{3}{\sqrt{100 - x^2}}$ on $[0, 5]$.

(b) $f(x) = x\sqrt[3]{3x - 7}$ on $[2, 5]$.