

MA 114 Worksheet #01: Substitution Review

1. Evaluate the following indefinite integrals and indicate the substitutions that you use.

(a) $\int \frac{4}{(1+2x)^3} dx$

(d) $\int \sec^3 x \tan x dx$

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

(e) $e^x \sin(e^x)$

(c) $\int \cos^4 x \sin x dx$

(f) $\frac{2x+3}{x^2+3x}$

2. Evaluate the following definite integrals and indicate the substitutions that you use.

(a) $\int_0^7 \sqrt{4+3x} dx$

(d) $\int_{-\pi/3}^{\pi/3} x^4 \sin x dx$

(b) $\int_0^{\pi/2} \cos(x) \cos(\sin(x)) dx$

(e) $\int_0^1 \frac{e^z+1}{e^z+z} dz$

(c) $\int_0^3 \frac{dx}{6x+1}$

(f) $\int_0^4 \frac{x}{\sqrt{1+2x}} dx$

3. If f is continuous and $\int_0^6 f(x) dx = 8$, find $\int_0^2 f(3x) dx$.

4. If f is continuous and $\int_0^{25} f(x) dx = 16$, find $\int_0^5 xf(x^2) dx$.

5. Find the area of the region between the graphs of $y = x^2$ and $y = x^4$.

6. Find the area of the regions enclosed by the graphs of $y = \sqrt{x}$ and $y = \frac{1}{4}x + \frac{3}{4}$ in two ways.

(a) Write this as an integral in x .

(b) Solve each equation to express x in terms of y and write an integral with respect to y .

7. Find the area of the region enclosed by the graphs of $y = x+1$ and $y = x^3 + x^2 - x + 1$.

8. What is the area of the region bounded by $f(x) = \frac{1}{x}$, $x = e^2$, $x = e^8$ and x -axis? Sketching the region might be helpful.

9. If f is continuous on $[0, 1]$, show that

$$\int_0^1 f(x) dx = \int_0^1 f(1-x) dx.$$

10. Find the area of the region bounded by the parabola $y = x^2$, the tangent line to the parabola at $(1, 1)$ and the x -axis.