

Worksheet 30: Substitutions

Russell Buehler

b.r@berkeley.edu

1. Evaluate:

(a) $\int \sqrt{x^2 - 1} x^5 dx$

(b) $\int \frac{z^2}{z^3+1} dz$

(c) $\int \frac{\sin(x)}{1+\cos^2(x)} dx$

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

2. Evaluate:

(a) $\int_1^e \frac{\ln(x)}{x} dx$



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(b) $\int_0^1 x e^{-x^2} dx$

(c) $\int_0^a x \sqrt{a^2 - x^2} dx$

3. Sketch the lines $y = 2x$ and $y = 3x$. Construct a series that gives exactly the area between the two over the interval $[0, 2]$.

4. How might you express the area from (3) as an integral?

5. What if the lines were $x = 3y$, $x = 2y$, and I wanted the area between the two horizontally?

6. Sketch the region enclosed by the two curves and find its area: $y = x^2$, $y = 4x - x^2$