

# MTH 252Z Lab

## Substitution

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### Prompts

1. What differentiation rule does substitution “undo”?
2. The integral  $\int_{-a}^a f(x) \, dx$  is very easy to integrate if we identify that  $f$  is an odd function. How can we identify if  $f$  is odd?
3. Integrate. You do not need to show all work. *The purpose of this exercise is to increase your proficiency and speed with linear substitutions. Look for the pattern!*

(a)  $\int \sin t \, dt$

(g)  $\int e^t \, dt$

(b)  $\int \sin(2t) \, dt$

(h)  $\int e^{2t} \, dt$

(c)  $\int \sin(3t) \, dt$

(i)  $\int e^{3t} \, dt$

(d)  $\int \sin(4t) \, dt$

(j)  $\int e^{4t} \, dt$

(e)  $\int \sin(5t) \, dt$

(k)  $\int e^{5t} \, dt$

(f)  $\int \sin(31415t) \, dt$

(l)  $\int e^{31415t} \, dt$

4. Evaluate the following integrals.

(a)  $\int \frac{x^3}{\sqrt{1-x^4}} \, dx.$

(b)  $\int \sqrt{2z+1} \, dz$

(c)  $\int_0^{12} \sqrt{2z+1} \, dz$

(d)  $\int_2^e \frac{2}{t \ln t} \, dt$

(e)  $\int_0^{\frac{\pi}{4}} \sin(\tan x) \sec^2 x \, dx$

(f)  $\int_{-1}^1 \frac{y^2 \sin y}{y^4 + 3y^2 + 1} \, dy$

(g)  $\int_{-5}^5 (2 - |x|) \, dx$

(h)  $\int_{-12}^0 \sqrt{144 - x^2} \, dx$