## Exercise 12

Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function.

$$R(y) = \int_y^2 t^3 \sin t \, dt$$

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**Solution**

According to part 1 of the fundamental theorem of calculus,

$$\frac{d}{dx} \int_a^x f(t) \, dt = f(x).$$

Rewrite $R(y)$ so that the variable is in the upper limit.

$$R(y) = -\int_2^y t^3 \sin t \, dt$$

As a result,

$$\begin{aligned} R'(y) &= -\frac{d}{dy} \int_2^y t^3 \sin t \, dt \\ &= -y^3 \sin y. \end{aligned}$$