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

(a) $g(x) = \int_1^x \ln(1+t^2)\,dt$

(b) $h(u) = \int_0^u \frac{\sqrt{t}}{t+1}\,dt$

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

(d) $h(x) = \int_1^{\sqrt{x}} \frac{z^2}{z^4+1}\,dz$

(e) $y = \int_0^{x^4} \cos^2(\theta)\,d\theta$

(f) $y = \int_{\sin(x)}^1 \sqrt{1+t^2}\,dt$

Exercise 2 Evaluate the integral.

(a) $\int_0^1 (1 - 8v^3 + 16v^7)\,dv$

(b) $\int_{-5}^5 e\,dx$

(c) $\int_{-1}^2 (3u-2)(u+1)\,du$

(d) $\int_{\pi/4}^{\pi/3} \csc^2(\theta)\,d\theta$

(e) $\int_0^1 \cosh(t)\,dt$

(f) $\int_1^3 \frac{y^3 - 2y^2 - y}{y^2}\,dy$

Exercise 3 Find the derivative of the function.

$$g(x) = \int_{1-2x}^{1+2x} t\sin(t)\,dt$$

Exercise 4 If $f(x) = \int_0^x (1-t^2)e^{t^2}\,dt$, on what interval is f increasing?

Exercise 5 The **error function** is defined as follows:

$$\operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2}\,dt$$

Show that the function $y = e^{x^2}\operatorname{erf}(x)$ satisfies the differential equation $y' = 2xy + \frac{2}{\sqrt{\pi}}$.