[6.4] REVIEW PROBLEMS

(1) Find each of these derivatives:

(a) \( \frac{d}{dx} \int_3^x \cos(\sqrt{t}) \, dt = \)  
(b) \( \frac{d}{dt} \int_4^t \cos(\sqrt{x}) \, dx = \)

(c) \( \frac{d}{dm} \int_2^m \ln(t^2 + 1) \, dt = \)
(d) \( \frac{d}{dm} \int_1^m \ln(t + 1) \, dt = \)

(2) \( Si(x) = \int_1^x \frac{\sin(t)}{t} \, dt \) is a function used in Optics. Find each of these derivatives:

(a) \( \frac{d}{dx} (2e \cdot Si(x)) \)  
(b) \( \frac{d}{dw} Si(w^2) \)  
(c) \( \frac{d}{dx} [e^{x^2} \cdot Si(x)] \)

(3) The \textit{error function}, \( \text{erf}(x) \), is defined by \( \text{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} \, dt \). Find each of these derivatives:

(a) \( \frac{d}{dx} \text{erf}(-(\ln x)^{1/2}) \)
(b) \( \frac{d}{dw} \int_w^{w^2} e^{-u^2} \, du \)

(4) Let \( R(x) = \int_0^x \sqrt{1 + t^2} \, dt \)

(a) Is \( R \) increasing or decreasing? Why?

(b) Discuss concavity?

(c) Sketch a labeled graph of \( R(x) \rightarrow \rightarrow \rightarrow \) HERE \( \downarrow \)
WHERE DOES \( R \) CROSS THE \textit{x}-AXIS?

BONUS QUESTIONS – \textbf{SHOW WORK} ON THE BACK.

(d) Determine if \( R \) is an even or an odd function.

(e) Find the value of \( \lim_{x \to \infty} \left( \frac{R(x)}{x^2} \right) \).