1 3.2: Derivative Rules

Derivative Rules:
If $f$ and $g$ are differentiable functions, then...

$$\frac{d}{dx}(x^n) =$$

$$\frac{d}{dx}(cf(x)) =$$

$$\frac{d}{dx}(f(x) \pm g(x)) =$$

$$\frac{d}{dx}(f(x) \cdot g(x)) =$$

$$\frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) =$$

Examples:
Compute the derivative of $f(x) = \frac{2\sqrt{x} - x}{\sqrt{x} + 3}$.
Find the derivative of \( f(x) = (4x^2 - 1)(7x^3 + x) \).

Given \( f(4) = 3 \) and \( f'(4) = -5 \), find the derivative of:

\[
g(x) = \sqrt{f(x)} \quad h(x) = \frac{x}{f(x)}
\]

**On Beyond Average:** Find the derivative of \( g(x) = \begin{cases} x^3 - x & \text{if } x \leq -1 \\ 2x - 4 & \text{if } x > -1 \end{cases} \)

Is this function differentiable at \( x = -1 \)? Justify your answer.