Objective: **Simplify the derivative of a function using algebra.**

Find the derivative of the function $f(x) = \dfrac{x}{\sqrt{x^4+4}}$.

ANSWER:

$$f(x) = \frac{x}{\sqrt{x^4+4}} = \frac{x}{\left(x^4+4\right)^{\frac{1}{2}}}$$

$$f'(x) = \frac{\left(x^4+4\right)^{\frac{1}{2}}(1) - \left[\frac{1}{2}x\left(x^4+4\right)^{-\frac{1}{2}}\left(4x^3\right)\right]}{\left(\left(x^4+4\right)^{\frac{1}{2}}\right)^2}$$

$$= \frac{\left(x^4+4\right)^{\frac{1}{2}} - \left[2x^4\left(x^4+4\right)^{-\frac{1}{2}}\right]}{x^4+4}$$

$$= \frac{\left(x^4+4\right)^{\frac{1}{2}} - 2x^4\left(x^4+4\right)^{-\frac{1}{2}}}{x^4+4}$$

$$= \frac{\left(x^4+4\right)^{-\frac{1}{2}}\left[\left(x^4+4\right) - 2x^4\right]}{x^4+4}$$

$$= \left(x^4+4\right)^{-\frac{3}{2}}\left(x^4+4-2x^4\right)$$

$$= \frac{x^4+4-2x^4}{\left(x^4+4\right)^{\frac{3}{2}}}$$

$$= \frac{4-x^4}{\left(x^4+4\right)^{\frac{3}{2}}}$$