If $f(x) = \frac{1}{\sqrt[4]{x}}$, then find $f'(x)$.

$= x^{-1/4} \implies f'(x) = -\frac{1}{4} x^{-5/4}$

A. $f'(x)$ does not exist

B. $f'(x) = \frac{-1}{(4x)\sqrt[4]{x}}$

C. $f'(x) = \frac{-1}{(2x^2)\sqrt{x}}$

D. $f'(x) = \frac{-1}{8x\sqrt{x}}$

$= \frac{1}{4x^{5/4}}$

$= \frac{1}{4x^{4/4} \cdot x^{1/4}}$

$= \frac{1}{4x \cdot x^{1/4}}$

$= \frac{1}{(4x)\sqrt[4]{x}}$

Example:

Suppose that the total cost in hundreds of dollars to produce x thousand cases of a beverage is given by:

$$C(x) = 4x^2 + 100x + 500$$

a) Find the marginal cost when $x = 5$.

$C'(x) = 4(2x) + 100$

$C'(5) = 8(5) + 100 = 140$

$= \boxed{\$14{,}000 \text{ for the } 6000^{th} \text{ case having produced } 5000 \text{ cases}}$

b) Find the marginal cost when $x = 300$

$C'(300) = 8(300) + 100 = 2400 + 100$

$= 2500$

$= \boxed{\$250{,}000 \text{ for the } 301 \text{ thousanth case having produced } 300{,}000 \text{ cases}}$

The number of Americans (in thousands) who are expected to be over 100 years old can be approximated by the function $f(t) = 0.00943t^3 - 0470t^2 + 11.085t + 23.441$ where t is the number of years after 2000.

Find a formula giving the rate of change of the number of Americans over 100 years old.

A. $f'(t) = 0.02829t^2 - 0.940t + 11.085$
B. $f'(t) = 0.134t + 5$
C. $f'(t) = 0.02829t^2 + 0.940t + 11.085$