

Find $f'(4)$ for the function $f(x) = 2x + \frac{8}{\sqrt{x}} + \frac{32}{x}$

$$f(x) = 2x + \frac{8}{\sqrt{x}} + \frac{32}{x}$$

Write each of the terms as x^n

$$f(x) = 2x + 8x^{-\frac{1}{2}} + 32x^{-1}$$

Use the power rule to differentiate each of the terms

$$\frac{d}{dx}(ax^n) = anx^{n-1}$$

$$f'(x) = 2 + 8\left(-\frac{1}{2}\right)x^{-\frac{3}{2}} + 32(-1)x^{-2}$$

Simplify

$$f'(x) = 2 - 4x^{-\frac{3}{2}} - 32x^{-2}$$

$$f'(x) = 2 - \frac{4}{x^{\frac{3}{2}}} - \frac{32}{x^2}$$

$$f'(x) = 2 - \frac{4}{\sqrt{x^3}} - \frac{32}{x^2}$$

Now substitute $x = 4$

$$f'(4) = 2 - \frac{4}{\sqrt{4^3}} - \frac{32}{4^2}$$

$$f'(4) = 2 - \frac{4}{\sqrt{64}} - \frac{32}{16}$$

$$f'(4) = 2 - \frac{4}{8} - \frac{32}{16}$$

$$f'(4) = 2 - \frac{1}{2} - 2$$

$$f'(4) = -\frac{1}{2}$$