

Solution

$$\frac{d}{dx} \left(\left(\left(-\frac{1}{3} \right) (x-8) \right)^n \right) = -\frac{n \left(-\frac{x-8}{3} \right)^{n-1}}{3}$$

Steps

$$\frac{d}{dx} \left(\left(\left(-\frac{1}{3} \right) (x-8) \right)^n \right)$$

Apply the chain rule: $n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$

Hide Steps

$$\frac{d}{dx} \left(\left(\left(-\frac{1}{3} \right) (x-8) \right)^n \right)$$

Apply the chain rule: $\frac{df(u)}{dx} = \frac{df}{du} \cdot \frac{du}{dx}$

$$f = u^n, \quad u = \left(-\frac{1}{3} \right) (x-8)$$

$$= \frac{d}{du} (u^n) \frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$$

$$\frac{d}{du} (u^n) = nu^{n-1}$$

Hide Steps

$$\frac{d}{du} (u^n)$$

Apply the Power Rule: $\frac{d}{dx} (x^a) = a \cdot x^{a-1}$

$$= nu^{n-1}$$

$$= nu^{n-1} \frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$$

Substitute back $u = \left(-\frac{1}{3} \right) (x-8)$

$$= n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$$

$$= n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$$

$$\frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right) = -\frac{1}{3}$$

Hide Steps

$$\frac{d}{dx} \left(\left(-\frac{1}{3} \right) (x-8) \right)$$

Take the constant out: $(a \cdot f)' = a \cdot f'$

$$= -\frac{1}{3} \frac{d}{dx} (x-8)$$

Apply the Sum/Difference Rule: $(f \pm g)' = f' \pm g'$

$$= -\frac{1}{3} \left(\frac{d}{dx} (x) - \frac{d}{dx} (8) \right)$$

$$\frac{d}{dx} (x) = 1$$

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

Apply the common derivative: $\frac{d}{dx} (x) = 1$

$$= 1$$

$$\frac{d}{dx} (8) = 0$$

Hide Steps

$$\frac{d}{dx} (8)$$

Derivative of a constant: $\frac{d}{dx} (a) = 0$

$$= 0$$

$$= -\frac{1}{3} (1 - 0)$$

Simplify

$$= -\frac{1}{3}$$

$$= n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \left(-\frac{1}{3} \right)$$

Simplify $n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \left(-\frac{1}{3} \right)$: $- \frac{n \left(-\frac{x-8}{3} \right)^{n-1}}{3}$

Hide Steps

$$n \left(\left(-\frac{1}{3} \right) (x-8) \right)^{n-1} \left(-\frac{1}{3} \right)$$

Remove parentheses: $(-a) = -a$

$$= -n \left(-\frac{1}{3} (x-8) \right)^{n-1} \frac{1}{3}$$

Multiply fractions: $a \cdot \frac{b}{c} = \frac{a \cdot b}{c}$

$$= -\frac{1}{3} \cdot n \left(-\frac{1}{3} (x-8) \right)^{n-1}$$

Multiply: $1 \cdot n = n$

$$= -\frac{n}{3} \left(-\frac{1}{3} (x-8) \right)^{n-1}$$

Multiply fractions: $a \cdot \frac{b}{c} = \frac{a \cdot b}{c}$

$$= -\frac{n\left(-\frac{1}{3}(x-8)\right)^{n-1}}{3}$$

$$\left(-\frac{1}{3}(x-8)\right)^{n-1} = \left(-\frac{x-8}{3}\right)^{n-1}$$

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$$\left(-\frac{1}{3}(x-8)\right)^{n-1}$$

Multiply $-\frac{1}{3}(x-8) : -\frac{x-8}{3}$

Hide Steps

$$-\frac{1}{3}(x-8)$$

Multiply fractions: $a \cdot \frac{b}{c} = \frac{a \cdot b}{c}$

$$= -\frac{1 \cdot (x-8)}{3}$$

$$1 \cdot (x-8) = x-8$$

Hide Steps

$$1 \cdot (x-8)$$

Multiply: $1 \cdot (x-8) = (x-8)$

$$= (x-8)$$

Remove parentheses: $(a) = a$

$$= x-8$$

$$= -\frac{x-8}{3}$$

$$= \left(-\frac{x-8}{3}\right)^{n-1}$$

$$= -\frac{n\left(-\frac{x-8}{3}\right)^{n-1}}{3}$$

$$= -\frac{n\left(-\frac{x-8}{3}\right)^{n-1}}{3}$$

Graph

Plotting: $-\frac{n\left(-\frac{x-8}{3}\right)^{n-1}}{3}$ assuming $n = 1$

