

Take the derivative with respect to x of the following functions

$$y = x^2$$

$$\frac{d}{dx} \left\{ \right.$$

$$\frac{d}{dx}(y) = \frac{d}{dx}(x^2)$$

$$\frac{dy}{dx} = 2x^{2-1} = 2x$$

$$\boxed{\frac{dy}{dx} = 2x}$$

$$y = 3x^2 + x - 2$$

$$y = 3x^2 + x - 2x^0$$

$$\frac{d}{dx} \left\{ \right.$$

$$\frac{dy}{dx} = 6x + 1 - 0$$

$$\boxed{\frac{dy}{dx} = 6x + 1}$$

$$y = \frac{3}{2}x^2 - 2x + 287$$

$$\frac{d}{dx} \left\{ \right.$$

$$\frac{dy}{dx} = 3x - 2$$

$$\boxed{\frac{dy}{dx} = 3x - 2}$$

$$y = 3x^{\frac{2}{3}} + x$$

$$\frac{d}{dx} \left\{ \right.$$

$$\frac{dy}{dx} = 2x^{-\frac{1}{3}} + 1$$

$$\boxed{\begin{aligned} \frac{dy}{dx} &= 2x^{-\frac{1}{3}} + 1 \\ &= \frac{2}{x^{\frac{1}{3}}} + 1 \end{aligned}}$$

$$y = x(x + 1)$$

$$y = x^2 + x$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = 2x + 1 \right)$$

$$\frac{dy}{dx} = 2x + 1$$

$$y = \frac{2}{3}x(x^2 + 2x - 3)$$

$$y = \frac{2}{3}x^3 + \frac{4}{3}x^2 - 2x$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = 2x^2 + \frac{8}{3}x - 2 \right)$$

$$\frac{dy}{dx} = 2x^2 + \frac{8}{3}x - 2$$

$$y = 3(x - 1)^2 + 6x - 3$$

$$y = 3x^2 - 6x + 3 + 6x - 3$$

$$y = 3x^2$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = 6x \right)$$

$$\frac{dy}{dx} = 6x$$

$$y = \frac{x^3 + x}{2x}$$

$$y = \frac{x^3}{2x} + \frac{x}{2x}$$

$$y = \frac{1}{2}x^2 + \frac{1}{2}$$

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

$$\frac{dy}{dx} = x$$

$$y = 2x^{\frac{3}{2}} + x(x^{\frac{1}{2}} + 1)$$

$$y = 2x^{\frac{3}{2}} + x^{\frac{3}{2}} + x$$

$$y = 3x^{\frac{3}{2}} + x$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = \frac{9}{2} x^{\frac{1}{2}} + 1 \right)$$

$$\boxed{\frac{dy}{dx} = \frac{9}{2} x^{\frac{1}{2}} + 1}$$

$$= \frac{9}{2} \sqrt{x} + 1$$

$$y = (x^{\frac{1}{2}} + 1)^2 - x$$

$$y = \cancel{x} + 2x^{\frac{1}{2}} + 1 - \cancel{x}$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = x^{-\frac{1}{2}} \right)$$

$$\boxed{\frac{dy}{dx} = x^{-\frac{1}{2}}}$$

$$= \frac{1}{\sqrt{x}}$$

$$y = x^{\frac{3}{2}}(x^{\frac{5}{3}} + \sqrt{x}) + 1$$

$$y = x^{\frac{19}{6}} + x^2 + 1$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = \frac{19}{6} x^{\frac{13}{6}} + 2x \right)$$

$$\boxed{\frac{dy}{dx} = \frac{19}{6} x^{\frac{13}{6}} + 2x}$$

$$y = \frac{3x^2(x^{\frac{5}{2}} + \sqrt{x^3}) + 1}{4x}$$

$$y = \frac{3}{4} x (x^{\frac{5}{2}} + x^{\frac{3}{2}}) + \frac{1}{4} x^{-1}$$

$$y = \frac{3}{4} x^{\frac{7}{2}} + \frac{3}{4} x^{\frac{5}{2}} + \frac{1}{4} x^{-1}$$

$$\frac{d}{dx} \left(\frac{dy}{dx} = \frac{21}{8} x^{\frac{5}{2}} + \frac{15}{8} x^{\frac{3}{2}} - \frac{1}{4} x^{-2} \right)$$

$$\boxed{\frac{dy}{dx} = \frac{21}{8} x^{\frac{5}{2}} + \frac{15}{8} x^{\frac{3}{2}} - \frac{1}{4} x^{-2}}$$

$$y = 3x^2 + \frac{1}{x}$$

$$y = 3x^2 + x^{-1}$$

$$\frac{d}{dx} \downarrow \frac{dy}{dx} = 6x - x^{-2}$$

$$\boxed{\begin{aligned} \frac{dy}{dx} &= 6x - x^{-2} \\ &= 6x - \frac{1}{x^2} \end{aligned}}$$

$$y = \frac{3x+1}{4x^{\frac{3}{2}}}$$

$$y = \frac{3x}{4x^{\frac{3}{2}}} + \frac{1}{4x^{\frac{3}{2}}}$$

$$y = \frac{3}{4}x^{-\frac{1}{2}} + \frac{1}{4}x^{-\frac{3}{2}}$$

$\frac{d}{dx}$

$$\boxed{\begin{aligned} \frac{dy}{dx} &= -\frac{3}{8}x^{-\frac{3}{2}} - \frac{3}{8}x^{-\frac{5}{2}} \\ &= -\frac{3}{8} \left(\frac{1}{\sqrt{x^3}} + \frac{1}{\sqrt{x^5}} \right) \end{aligned}}$$

$$y = x^2 + \frac{2x^{\frac{2}{3}} + x + 1}{x^3} + 1$$

$$y = x^2 + 2x^{-\frac{7}{3}} + x^{-2} + x^{-3} + 1$$

$\frac{d}{dx}$

$$\frac{dy}{dx} = 2x - \frac{14}{3}x^{-\frac{10}{3}} - 2x^{-3} - 3x^{-4}$$

$$\boxed{\frac{dy}{dx} = 2x - \frac{14}{3}x^{-\frac{10}{3}} - 2x^{-3} - 3x^{-4}}$$

$$y = 2(\sqrt{x})(x^{\frac{3}{4}}) + 1$$

$$y = 2x^{\frac{1}{2}}x^{\frac{3}{4}} + 1$$

$$y = 2x^{\frac{5}{4}} + 1$$

$\frac{d}{dx}$

$$\frac{dy}{dx} = \frac{5}{2}x^{\frac{1}{4}}$$

$$\boxed{\frac{dy}{dx} = \frac{5}{2}x^{\frac{1}{4}}}$$

$$y(x) = ax^2 + bx + c$$

$$\frac{d}{dx} \left(\right. \frac{dy}{dx} = 2ax + b$$

$$\boxed{\frac{dy}{dx} = 2ax + b}$$

$$y(x) = a(x-b)^2 - \sqrt{cx}$$

$$\frac{d}{dx} \left(\right. \begin{aligned} y(x) &= ax^2 - 2abx + ab^2 - c^{\frac{1}{2}}x^{\frac{1}{2}} \\ \frac{dy}{dx} &= 2ax - 2ab - \frac{1}{2}c^{\frac{1}{2}}x^{-\frac{1}{2}} \end{aligned}$$

$$\boxed{\begin{aligned} \frac{dy}{dx} &= 2ax - 2ab - \frac{c^{\frac{1}{2}}}{2}x^{-\frac{1}{2}} \\ &= 2a(x-b) - \frac{1}{2}\sqrt{\frac{c}{x}} \end{aligned}}$$

$$y(x) = \frac{a(x^2 - bx)}{bc} + \frac{d}{\sqrt{x}}$$

$$y(x) = \frac{a}{bc}x^2 - \frac{a}{c}x + dx^{-\frac{1}{2}}$$

$$\frac{d}{dx} \left(\right. \frac{dy}{dx} = \frac{2a}{bc}x - \frac{a}{c} - \frac{d}{2}x^{-\frac{3}{2}}$$

$$\boxed{\frac{dy}{dx} = \frac{2a}{bc}x - \frac{a}{c} - \frac{d}{2}x^{-\frac{3}{2}}}$$