

(1) [3 points] Differentiate: $v = t^3 - \frac{1}{\sqrt[5]{t^4}} = t^3 - t^{-\frac{4}{5}}$

$$\therefore v' = 3t^2 + \frac{4}{5} t^{-\frac{9}{5}}$$

(2) [4 points] Differentiate: $y = \frac{x^2}{1 + \sqrt{x}} = \frac{x^2}{1 + x^{1/2}}$

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

(3) [4 points] Determine $\frac{dy}{dx}$: $y = (5x - 2)^4(7x^2 + 3)^{-2}$

$$\begin{aligned}\frac{dy}{dx} &= 4(5x-2)^3(5)(7x^2+3)^{-2} + (5x-2)^4(-2)(7x^2+3)^{-3}(14x) \\ &= 20(5x-2)^3(7x^2+3)^{-2} - 28x(5x-2)^4(7x^2+3)^{-3}\end{aligned}$$

(4) [4 points] Find $f'(x)$: $f(x) = \cos(x \sin x)$

$$f'(x) = -\sin(x \cdot \sin x) \cdot [\sin x + x \cos x]$$