

## Quiz 2.3-2.4 Review

What is the derivative of the following?

①  $y = 5x^4 \sqrt{x^3 - 4x}$     ②  $f(x) = \frac{-3x^5}{\tan x}$     ③  $g(x) = -4 \csc^3(\pi x)$

④  $y = 2x^6 - 3x^5 + x^2$  Find  $y''$

①  $y' = (20x^3)(x^3 - 4x)^{\frac{1}{2}} + (5x^4)\left(\frac{1}{2}(x^3 - 4x)^{-\frac{1}{2}}(3x^2 - 4)\right)$

$$y' = 20x^3(x^3 - 4x)^{\frac{1}{2}} + \frac{5x^4(3x^2 - 4)}{2(x^3 - 4x)^{\frac{1}{2}}}$$

$$\frac{20x^3(x^3 - 4x)^{\frac{1}{2}}(2(x^3 - 4x)^{\frac{1}{2}}) - 40x^3(x^3 - 4x)^{-\frac{1}{2}}}{(2(x^3 - 4x)^{\frac{1}{2}})^2} = \frac{40x^3(x^3 - 4x) - 40x^3(x^3 - 4x)^{-\frac{1}{2}}}{2(x^3 - 4x)}$$

$$y' = \frac{40x^3(x^3 - 4x) + 5x^4(3x^2 - 4)}{2\sqrt{x^3 - 4x}} = \frac{40x^6 - 160x^4 + 15x^6 - 20x^4}{2\sqrt{x^3 - 4x}} = \frac{55x^6 - 180x^4}{2\sqrt{x^3 - 4x}}$$

②  $f'(x) = \frac{(-15x^4)(\tan x) - (-3x^5)(\sec^2 x)}{(\tan x)^2} = \frac{-3x^4(5 \tan x - x \sec^2 x)}{\tan^2 x}$

$$\frac{5x^4(11x^2 - 36)}{2\sqrt{x^3 - 4x}}$$

③  $g'(x) = -4(3(\csc(\pi x))^2(-\csc(\pi x)\cot(\pi x))(\pi))$

$$g'(x) = 12\pi \csc^3(\pi x)\cot(\pi x) = 12\pi \left(\frac{1}{\sin^3(\pi x)}\right) \left(\frac{\cos(\pi x)}{\sin(\pi x)}\right) = \frac{12\pi \cos \pi x}{\sin^4 \pi x}$$

④  $y' = 12x^5 - 15x^4 + 2x$

$$y'' = 60x^4 - 60x^3 + 2$$