2.2

$f(x) = c \Rightarrow f'(x) = 0$

Ex $f(x) = 9 \rightarrow f'(x) = 0$

$D_t[\pi x] = 0$

$f(x) = x^n$

$\boxed{f'(x) = n x^{n-1}}$

Ex $f(x) = x^3$ $\quad \frac{df}{dx} = 3x^2$

$\frac{a}{b} - 1 = \frac{a-b}{b}$

Ex $y = x^{2/3}$ $\quad \frac{dy}{dx} = \frac{2}{3} x^{-1/3}$ $\quad y'$

Ex $y = \frac{1}{x^4} = x^{-4}$

$y' = -4x^{-5}$

Ex. $D_x(x^{\sqrt{2}}) = \sqrt{2}\, x^{\sqrt{2}-1}$

Ex $y = (x^{2+\pi})^{1/2}$

$= x^{\frac{2+\pi}{2}} \rightarrow 1 + \frac{\pi}{2}$

$y' = \left(\frac{2+\pi}{2}\right) x^{\pi/2}$

$(cx^n)' = ncx^{n-1}$

Ex $y = 8x^4 \rightarrow y' = 32x^3$

$y = -\frac{3}{4} x^{12}$

$y' = -9x^{11}$

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

$\underline{y' = 3x^2 + \frac{8}{3}x - 5}$

Ex $y = x^{5/2} + x^3 + \frac{1}{2}x^2 + 4$

$\underline{y' = \frac{5}{2}x^{3/2} + 3x^2 + x}$

$y^{(3)}(x) = y'''$

$y^{(4)}(x) = y^{IV}$

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

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

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

$y'' = 6x - 6$

$y''' = 6$

$y^{(4)} = 0$

$y''' = 3! \quad 3 \cdot 2 \cdot 1$

$= 6$

$y^{IV} = 0$

$f(x) = a_n x^n + \cdots$

$\boxed{f^{(n)}(x) = n!\,a_n}$

$f(x) = 4x^5 + 4x^4 + x^2 - 2$

36/ $f^{(5)}(x) = 5!(4) = 480$

37/ $f^{(6)}(x) = 0$

$(\sqrt{x})' = \frac{1}{2\sqrt{x}}$ $\left(\frac{1}{x}\right)' = -\frac{1}{x^2}$ $\left(\frac{1}{x}\right)' = (x^{-1})'$

$-x^{-2}$

#8/ $p(t) = 12t^4 - 6\sqrt{t} + \frac{5}{t}$

$p'(t) = 48t^3 - \frac{3}{\sqrt{t}} - \frac{5}{t^2}$

10/ $y = \frac{x^3 - 4x}{\sqrt{x}} = \frac{x^3}{x^{1/2}} - 4\frac{x}{x^{1/2}}$

$= x^{5/2} - 4x^{1/2}$

$y' = \frac{5}{2}x^{3/2} - 2x^{-1/2}$

19/ $f(x) = 4x^{5/3} + 6x^{-3/2} - 11x$

$f' = \frac{20}{3}x^{2/3} - 9x^{-5/2} - 11$

23/ $f(t) = 3\sqrt[3]{t^2} - \frac{2}{\sqrt{t^3}}$

$= 3t^{2/3} - 2t^{-3/2}$

$f'(t) = 2t^{-1/3} + 3t^{-5/2}$

$= \frac{2}{t^{1/3}} + \frac{3}{t^{5/2}}$

$= \frac{2}{\sqrt[3]{t}} + \frac{3}{t^2\sqrt{t}}$