

Jan 22 Extra Credit Derivative Practice

$$1.) \frac{d}{dx}(1) = \boxed{0}$$

$$\begin{aligned} 2.) \frac{d}{dx}(4x^3 + 2x^2 + 7) &= 4 \frac{d}{dx} x^3 + 2 \frac{d}{dx} x^2 + \frac{d}{dx} 7 \\ &= 4 \cdot 3x^2 + 2 \cdot 2x + 0 \\ &= \boxed{12x^2 + 4x} \end{aligned}$$

$$\begin{aligned} 3.) \frac{d}{dx}(5\sqrt{x}) &= 5 \frac{d}{dx} \sqrt{x} \\ &= 5 \frac{d}{dx} x^{1/2} \\ &= \frac{5}{2} x^{-1/2} \\ &= \boxed{\frac{5}{2\sqrt{x}}} \end{aligned}$$

$$4.) \frac{d}{dx}\left(\frac{1}{x^3}\right) = \frac{d}{dx} x^{-3} = \boxed{-3x^{-4}}$$

$$5.) \frac{d}{dx} x^8 = \boxed{8x^7}$$

$$\begin{aligned} 6.) \frac{d}{dx} \sqrt{x^2 + x + 1} &= \frac{d}{dx} (x^2 + x + 1)^{1/2} = \frac{1}{2} (x^2 + x + 1)^{-1/2} \frac{d}{dx} (x^2 + x + 1) \\ &= \boxed{\frac{1}{2} (x^2 + x + 1)^{-1/2} (2x + 1)} \end{aligned}$$

$$\begin{aligned} 7.) \frac{d}{dx}(3x^3 + 9) &= 3 \frac{d}{dx} x^3 + \frac{d}{dx} 9 \\ &= 3 \cdot 3x^2 \\ &= \boxed{9x^2} \end{aligned}$$

$$\begin{aligned} 8.) \frac{d}{dx} \left(\frac{5}{x^2} + 2\sqrt{x} \right) &= 5 \frac{d}{dx} x^{-3} + 2 \frac{d}{dx} x^{1/2} \\ &= -10 x^{-3} + x^{-1/2} \\ &= \boxed{\frac{-10}{x^3} + \frac{1}{\sqrt{x}}} \end{aligned}$$

$$\begin{aligned} 9.) \frac{d}{dx} \left(\frac{1}{4x+x^2} \right) &= \frac{d}{dx} (4x+x^2)^{-1} \\ &= -1 (4x+x^2)^{-2} \frac{d}{dx} (4x+x^2) \\ &= -(4x+x^2)^{-2} (4+2x) \\ &= \boxed{-\frac{4+2x}{(4x+x^2)^2}} \end{aligned}$$