Jan 22 Extra Credit Derivative Practice

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

2.) $\frac{d}{dx}(4x^3 + 2x^2 + 7) = 4\frac{d}{dx}x^3 + 2\frac{d}{dx}x^2 + \frac{d}{dx}7$

$$= 4 \cdot 3x^2 + 2 \cdot 2x + 0$$

$$= \boxed{12x^2 + 4x}$$

3.) $\frac{d}{dx}(5\sqrt{x}) = 5\frac{d}{dx}\sqrt{x}$

$$= 5\frac{d}{dx}x^{1/2}$$

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

$$\boxed{= \frac{5}{2\sqrt{x}}}$$

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

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

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

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

7.) $\frac{d}{dx}(3x^3+9) = 3\frac{d}{dx}x^3 + \frac{d}{dx}9$

$$= 3 \cdot 3x^2$$

$$= \boxed{9x^2}$$

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

$$= -10\,x^{-3} + x^{-1/2}$$

$$= \boxed{\frac{-10}{x^3} + \frac{1}{\sqrt{x}}}$$

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

$$= -1(4x+x^2)^{-2}\frac{d}{dx}(4x+x^2)$$

$$= -(4x+x^2)^{-2}(4+2x)$$

$$= \boxed{-\frac{4+2x}{(4x+x^2)^2}}$$