HW Review

6. What is $\lim_{h\to 0} \dfrac{8\left(\frac{1}{2}+h\right)^8 - 8\left(\frac{1}{2}\right)^8}{h}$?

$$f'(c) = \lim_{h\to 0} \frac{f(c+h)-f(c)}{h}$$

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) The limit does not exist.

(E) It cannot be determined from the information given.

$f(x) = 8x^8$

$c = \frac{1}{2}$

$f'(x) = 64x^7$

$\frac{1}{2} = f'\left(\frac{1}{2}\right) = 64\left(\frac{1}{2}\right)^7$

$= \cancel{64}\left(\frac{1}{\cancel{128}_{2}}\right)$

8. If $h(x) = f^2(x) - g^2(x)$, $f'(x) = -g(x)$, and $g'(x) = f(x)$, then $h'(x) =$

(A) 0 (B) 1 (C) $-4f(x)g(x)$

(D) $(-g(x))^2 - (f(x))^2$ (E) $-2(-g(x)+f(x))$

$h(x) = (f(x))^2 - (g(x))^2$

$h'(x) = 2(f(x)) \cdot f'(x) - 2g(x)g'(x)$

$= 2f(x)(-g(x)) - 2g(x)f(x)$

$= -2f(x)g(x) - 2g(x)f(x) = -4f(x)g(x)$

14. If $y = x^2 + 2$ and $u = 2x - 1$, then $\frac{dy}{du} =$ $\frac{dy}{dx} \cdot \frac{dx}{du} = (2x)\left(\frac{1}{2}\right) = x$

(A) $\frac{2x^2 - 2x + 4}{(2x-1)^2}$ (B) $6x^2 - 2x + 4$ (C) x^2

(D) x (E) $\frac{1}{x}$

$\frac{dy}{dx} = 2x$ $\frac{du}{dx} = 2$

22. $\frac{d}{dx}\left(\ln e^{2x}\right) =$ $\frac{d}{dx}(2x)$

(A) $\frac{1}{e^{2x}}$ (B) $\frac{2}{e^{2x}}$ (C) $2x$ (D) 1 (E) 2

$\ln e^{2x}$

$\log x^c = c \log x$

$= 2x \underbrace{\ln e}_{1} = 2x$

$$f(x) = \frac{x^2-3}{4x} = \overbrace{(x^2-3)}^{h}\overbrace{(4x)^{-1}}^{g}$$

u^{-1}

$\hookrightarrow 4x = u$

$$f'(x) = (2x)(4x)^{-1} + \left(-(4x)^{-2}\cdot 4\right)(x^2-3)$$

$-u^{-2}\cdot 4$

$$f(x) = \frac{n(x)}{d(x)} = n(x)\left(d(x)\right)^{-1}$$

$$f' = n'd^{-1} + -d^{-2}\cdot d'\cdot n$$

$$= \frac{d}{d}\frac{n'}{d} - \frac{d'n}{d^2} = \frac{n'd - d'n}{d^2}$$