

Classwork examples

p43

10) $y = x^2(2x-3)^4$

$$\begin{aligned} y' &= x^2 \cdot \frac{d}{dx} \left[(2x-3)^4 \right] + (2x-3)^4 \cdot 2x && \text{Prod. Rule} \\ &= x^2 \left(4(2x-3)^3 \cdot 2 \right) + 2x(2x-3)^4 \\ &= 8x^2(2x-3)^3 + 2x(2x-3)^4 \\ &= \cancel{2x(2x-3)^3} \left[4x + 2x-3 \right] \\ &= 6x(2x-3)^3(2x-1) \end{aligned}$$

$6x-3 = 3(2x-1)$

p43

11) $y = x\sqrt{4-x^2}$

$M = x^{1/2}$
 $B = 4-x^2$

$$\begin{aligned} y' &= x \cdot \frac{d}{dx} \left[(4-x^2)^{1/2} \right] + \sqrt{4-x^2} \\ &= x \cdot \left(\frac{1}{2}(4-x^2)^{-1/2} \cdot (-2x) \right) + \sqrt{4-x^2} \\ &= \frac{-x^2}{\sqrt{4-x^2}} + \sqrt{4-x^2} \\ &= \frac{-x^2}{\sqrt{4-x^2}} + \frac{\sqrt{4-x^2} \cdot \sqrt{4-x^2}}{\sqrt{4-x^2}} \end{aligned}$$



p43 #11 (continued)

$$= \frac{-x^2 + 4 - x^2}{\sqrt{4-x^2}}$$

$$= \frac{4 - 2x^2}{\sqrt{4-x^2}}$$

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12)

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

$$u = x^5$$

$$R = u^9 y$$

$$y' = 5 \left(\frac{2x-1}{2x+1} \right)^4 \cdot \frac{d}{dx} \left(u^9 y \right)$$

$$= 5 \left(\frac{2x-1}{2x+1} \right)^4 \cdot \frac{(2x+1)(2) - (2x-1)(2)}{(2x+1)^2}$$

$$= 5 \left(\frac{2x-1}{2x+1} \right)^4 \cdot \frac{2(2x+1 - 2x+1)}{(2x+1)^2}$$

$$= \frac{20(2x-1)^4}{(2x+1)^6}$$

p43 13) $y = \frac{x}{\sqrt{x^2-1}}$

$$y' = \frac{\sqrt{x^2-1} \cdot 1 - x \cdot \frac{1}{2}(x^2-1)^{-1/2} \cdot 2x}{x^2-1}$$

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

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

$$= \frac{-1}{(x^2-1)^{3/2}}$$

p43 14) $y = \sqrt{\frac{x}{4x-1}}$ $M = \sqrt{x}$
 $B = \frac{x}{4x-1}$

$$y' = \frac{1}{2} \left(\frac{x}{4x-1} \right)^{-1/2} \cdot \frac{(4x-1) - x \cdot 4}{(4x-1)^2}$$

$$= \frac{-1}{2(4x-1)^{5/2}}$$

p43

15) $y = (x^2 - 4)\sqrt{x+2}$

$$y' = (x^2 - 4) \cdot \frac{1}{2}(x+2)^{-\frac{1}{2}} + \sqrt{x+2} \cdot 2x$$

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$$= \frac{x^2 - 4}{2\sqrt{x+2}} + 2x\sqrt{x+2}$$

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

$$= \frac{5x^2 + 8x - 4}{2\sqrt{x+2}}$$

$$= \frac{(5x-2)(x+2)}{2(x+2)^{\frac{1}{2}}}$$

$$= \frac{1}{2}(5x-2)\sqrt{x+2}$$

p. 1/3

16)

$$y = f(x) \cdot g(x)$$

$$y' = f(x) \cdot g'(x) + g(x) \cdot f'(x)$$

$$y'(2) = f(2) \cdot g'(2) + g(2) \cdot f'(2)$$

$$= -3 \cdot -2 + 3 \cdot 6$$

$$= 6 + 18$$

$$= 24$$

17)

$$y = \frac{f(x)}{g(x)}$$

$$y' = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{[g(x)]^2}$$

$$y'(2) = \frac{g(2) \cdot f'(2) - f(2) \cdot g'(2)}{[g(2)]^2}$$

$$= \frac{3 \cdot 6 - -3 \cdot -2}{3^2}$$

$$= \frac{18 + 6}{9}$$

$$= 24/9$$

p 43 18) $y = [f(x)]^3$ $y' = 3 \cdot [f(x)]^2 \cdot f'(x)$

$$y'(2) = 3 [f(2)]^2 \cdot f'(2)$$

$$= 3 [-3]^2 \cdot 6$$

$$= 27 \cdot 6$$

$$= \textcircled{162}$$

19) $y = f(g(x))$ $y' = f'(g(x)) \cdot g'(x)$

$$y'(2) = f'(g(2)) \cdot g'(2)$$

$$= f'(3) \cdot (-2)$$

$$= 4 \cdot -2$$

$$= \textcircled{-8}$$