

2.4A pp 133-136 (1-33 odds, 67, 69, 75, 79)

1. $y = (6x-5)^4$

$$\begin{aligned} u &= 6x-5 \\ f(u) &= u^4 \end{aligned}$$

15. $y = (9x^2+4)^{1/3}$

$$\begin{aligned} y' &= \frac{1}{3}(9x^2+4)^{-2/3}(18x) \\ y' &= \frac{6x}{(9x^2+4)^{2/3}} \end{aligned}$$

3. $y = \sqrt{x^2-1}$

$$\begin{aligned} u &= x^2-1 \\ y &= \sqrt{u} \end{aligned}$$

17. $y = 2\sqrt[4]{4-x^2}$

$$\begin{aligned} y &= 2(4-x^2)^{1/4} \\ y' &= \frac{1}{2}(4-x^2)^{-3/4}(-2x) \end{aligned}$$

5. $y = \csc^3 x$

$$\begin{aligned} u &= \csc x \\ y &= u^3 \end{aligned}$$

$$y' = \frac{-x}{(4-x^2)^{3/4}}$$

7. $y = (2x-7)^3$

$$\begin{aligned} y' &= 3(2x-7)^2(2) \\ y' &= 6(2x-7)^2 \end{aligned}$$

19. $y = \frac{1}{x-2} = (x-2)^{-1}$

$$\begin{aligned} y' &= -1(x-2)^{-2}(1) \\ y' &= \frac{-1}{(x-2)^2} \end{aligned}$$

9. $g(x) = 3(4-9x)^4$

$$\begin{aligned} g'(x) &= 12(4-9x)^3(-9) \\ g'(x) &= -108(4-9x)^3 \end{aligned}$$

21. $f(t) = \left(\frac{1}{t-3}\right)^2$

$$\begin{aligned} f(t) &= (t-3)^{-2} \\ f'(t) &= -2(t-3)^{-3} \\ f'(t) &= \frac{-2}{(t-3)^3} \end{aligned}$$

11. $f(x) = (9-x^2)^{2/3}$

$$\begin{aligned} f'(x) &= \frac{2}{3}(9-x^2)^{-1/3}(-2x) \\ f'(x) &= \frac{-4x}{3\sqrt[3]{9-x^2}} \end{aligned}$$

23. $y = \frac{1}{\sqrt{x+2}}$

$$\begin{aligned} y &= (x+2)^{-1/2} \\ y' &= -\frac{1}{2}(x+2)^{-3/2} \\ y' &= \frac{-1}{2\sqrt{(x+2)^3}} \end{aligned}$$

13. $f(t) = (1-t)^{1/2}$

$$\begin{aligned} f'(t) &= \frac{1}{2}(1-t)^{-1/2}(-1) \\ f'(t) &= \frac{-1}{2(1-t)^{1/2}} \end{aligned}$$

$$25. f(x) = x^2(x-2)^4$$

$$f'(x) = x^2 \cdot 4(x-2)^3 + (x-2)^4(2x)$$

$$f'(x) = 4x^2(x-2)^3 + 2x(x-2)^4$$

$$f'(x) = 2x(x-2)^3(2x+x-2)$$

$$\boxed{f'(x) = 2x(x-2)^3(3x-2)}$$

$$27. y = x\sqrt{1-x^2} = x(1-x^2)^{1/2}$$

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

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

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

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

$$29. y = \frac{x}{\sqrt{x^2+1}} = \frac{x}{(x^2+1)^{1/2}}$$

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

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

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

$$\boxed{y' = \frac{1}{(x^2+1)^{3/2}}}$$

$$\boxed{y' = \frac{1}{(x^2+1)^{3/2}}}$$

$$31. g(x) = \left(\frac{x+5}{x^2+2}\right)^2$$

$$g'(x) = 2\left(\frac{x+5}{x^2+2}\right) \cdot \left[\frac{(x^2+2) - (x+5)(2x)}{(x^2+2)^2}\right]$$

$$g'(x) = 2\left(\frac{x+5}{x^2+2}\right) \left[\frac{x^2+2-2x^2-10x}{(x^2+2)^2}\right]$$

$$g'(x) = \frac{2(x+5)(-x^2-10x+2)}{(x^2+2)^3}$$

$$\boxed{g'(x) = \frac{-2(x+5)(x^2+10x-2)}{(x^2+2)^3}}$$

$$33. f(v) = \left(\frac{1-2v}{1+v}\right)^3$$

$$f'(v) = 3\left(\frac{1-2v}{1+v}\right)^2 \cdot \left[\frac{(1+v)(-2) - (1-2v)(1)}{(1+v)^2}\right]$$

$$f'(v) = \frac{3(1-2v)^2 \cdot [-2-2v-1+2v]}{(1+v)^2}$$

$$f'(v) = \frac{3(1-2v)^2(-3)}{(1+v)^4}$$

$$\boxed{f'(v) = \frac{-9(1-2v)^2}{(1+v)^4}}$$

$$67. s(t) = (t^2+2t+8)^{1/2} \quad (2,4)$$

$$s'(t) = \frac{1}{2}(t^2+2t+8)^{-1/2}(2t+2)$$

$$\boxed{s'(t) = \frac{t+1}{\sqrt{t^2+2t+8}}}$$

$$s'(2) = \frac{2+1}{\sqrt{2^2+2(2)+8}} = \frac{3}{\sqrt{16}} = \boxed{\frac{3}{4}}$$

$$69. f(x) = \frac{3}{x^3-4} \quad (-1, -3/5)$$

~~$$f(x) = \frac{3}{x^3-4}$$~~

$$f(x) = 3(x^3-4)^{-1}$$

$$f'(x) = -3(x^3-4)^{-2}(3x^2)$$

$$f'(x) = \frac{-9x^2}{(x^3-4)^2}$$

$$f'(-1) = \frac{-9(-1)^2}{[(-1)^3-4]^2} = \boxed{\frac{-9}{25}}$$

$$75. f(x) = (3x^2-2)^{1/2} \quad (3, 5)$$

$$f'(x) = \frac{1}{2}(3x^2-2)^{-1/2}(6x)$$

$$f'(x) = \frac{3x}{\sqrt{3x^2-2}}$$

$$f'(3) = \frac{3(3)}{\sqrt{3(3)^2-2}} = \frac{9}{\sqrt{25}} = \frac{9}{5}$$

$$\boxed{y-5 = \frac{9}{5}(x-3)}$$

$$79. f(x) = 2(x^2-1)^3$$

$$f'(x) = 6(x^2-1)^2(2x)$$

$$f'(x) = 12x(x^2-1)^2$$

$$f''(x) = 12x \cdot 2(x^2-1) \cdot 2x + (x^2-1)^2(12)$$

~~$$f''(x) = 12x$$~~

$$48x^2(x^2-1) + 12(x^2-1)^2$$

$$f''(x) = 12(x^2-1) [4x^2 + (x^2-1)]$$

$$\boxed{f''(x) = 12(x^2-1)(5x^2-1)}$$