

2.4 Chain Rule

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$$7) y = (4x-1)^3$$
$$y' = 3(4x-1)^2 \cdot (4)$$

$$y' = 12(4x-1)^2$$

$$9) g(x) = 3(4-9x)^4$$
$$g'(x) = 12(4-9x)^3 \cdot (-9)$$

$$g'(x) = -108(4-9x)^3$$

$$11) f(t) = (5-t)^{1/2}$$
$$f'(t) = \frac{1}{2}(5-t)^{-1/2} \cdot (-1)$$

$$f'(t) = \frac{-1}{2\sqrt{5-t}}$$

$$13) y = (6x^2+1)^{1/3}$$
$$y' = \frac{1}{3}(6x^2+1)^{-2/3} (12x)$$

$$y' = \frac{4x}{(6x^2+1)^{2/3}}$$

$$19) f(t) = \left(\frac{1}{t-3}\right)^2$$
$$f'(t) = 2\left(\frac{1}{t-3}\right) \cdot \left(\frac{(t-3)(0) - 1(1)}{(t-3)^2}\right)$$

$$f'(t) = \frac{-2}{(t-3)^3}$$

33) on back

$$23) f(x) = x^2(x-2)^4$$
$$f'(x) = x^2(4(x-2)^3)(1) + (x-2)^4(2x)$$

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

$$43) y = \cos 4x$$
$$y' = (-\sin 4x)(4)$$

$$y' = -4\sin 4x$$

$$44) y = \sin \pi x$$
$$y' = (\cos \pi x)(\pi)$$

$$y' = \pi \cos \pi x$$

$$45) g(x) = 5 \tan 3x$$
$$g'(x) = 5 \sec^2 3x \cdot (3)$$

$$g'(x) = 15 \sec^2 3x$$

$$46) h(x) = \sec x^2$$
$$h'(x) = \sec x^2 \tan x^2 \cdot (2x)$$

$$h'(x) = 2x \sec x^2 \tan x^2$$

$$47) y = \sin(\pi x)^2$$
$$y' = \cos(\pi x)^2 \cdot (2\pi x)(\pi)$$

$$y' = 2\pi^2 x \cos(\pi x)^2$$

$$48) y = \cos(1-2x)^2$$
$$y' = -\sin(1-2x)^2 \cdot (2(1-2x)(-2))$$

$$y' = 4(1-2x) \sin(1-2x)^2$$

$$49) h(x) = \sin 2x \cos 2x$$
$$h'(x) = \sin 2x \cdot (-\sin 2x \cdot (2)) + \cos 2x \cdot (\cos 2x \cdot (2))$$

$$h'(x) = -2 \sin^2 2x + 2 \cos^2 2x$$

$$33) f(x) = ((x^2+3)^5 + x)^2$$

$$f'(x) = 2((x^2+3)^5 + x) \cdot (5(x^2+3)^4(2x) + 1)$$

$$85) f(x) = 5(2-7x)^4$$

$$f'(x) = 20(2-7x)^3(-7)$$

$$f''(x) = -140(2-7x)^2$$

$$f''(x) = -420(2-7x)^2(-7)$$

$$f''(x) = 2940(2-7x)^2$$

$$193) f(x) = \cos x^2$$

$$f'(x) = -\sin x^2 \cdot 2x$$

$$f''(x) = -2x \sin x^2$$

$$f''(x) = -2x(\cos x^2(2x)) + \sin x^2(-2)$$

$$f''(x) = -4x^2 \cos x^2 - 2 \sin x^2$$

$$f''(0) = 0 - 2 \sin(0)$$

$$f''(0) = 0$$

127) True

128) True