

$$f(x) = (2x + 1)^3 \quad \text{Find } f'(x)$$

Method 1:

$$f(x) = 8x^3 + 12x^2 + 6x + 1$$

$$f'(x) = 24x^2 + 24x + 6$$

Correct Answer

Method 2:

$$f(x) = (2x + 1)^3$$

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

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

$$f'(x) = 12x^2 + 12x + 3$$

Not Correct

This answer needs to be multiplied by 2:

$$2(12x^2 + 12x + 3) = \\ 24x^2 + 24x + 6$$

$$f(x) = (2x^2 + 3x)^2 \quad \text{Find } f'(x)$$

Method 1:

$$f(x) = 4x^4 + 12x^3 + 9x^2$$

$$f'(x) = 16x^3 + 36x^2 + 18x$$

Correct Answer

Method 2:

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

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

$$f'(x) = 4x^2 + 6x$$

Not Correct

This answer needs to
multiplied by $4x + 3$:

$$(4x + 3)(4x^2 + 6x) = \\ 16x^3 + 36x^2 + 18x$$

The Chain Rule:

If $y = f(u)$ is a differentiable function of u and

$u = g(x)$ is a differentiable function of x , then

$y = f(g(x))$ is a differentiable composite function of x and

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} \quad \text{or} \quad \frac{d}{dx} [f(g(x))] = f'(g(x)) g'(x)$$

$$y = u^n \quad \text{Find} \quad \frac{dy}{dx}$$

$$\frac{dy}{dx} = nu^{n-1} \frac{du}{dx}$$

$$f(x) = \sqrt[3]{(x^2 - 3x)^\pi} \quad \text{Find} \quad f'(x)$$

$$f(x) = (x^2 - 3x)^{\pi/3}$$

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

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

$$f(x) = \sin(\cos 2x) \quad \text{Find } f'(x)$$

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

$$= \boxed{-2 \sin 2x \cos(\cos 2x)}$$

$$1 \quad \lim_{x \rightarrow 2} \frac{\sqrt{6-x} + 2}{\sqrt{3-x} - 1}$$

$$2 \quad \lim_{x \rightarrow 5} \frac{\sqrt{x-4} - 1}{x-5}$$

$$3 \quad \lim_{x \rightarrow 0} \frac{\sqrt{x+5} - 3}{x-4}$$

$$4 \quad \lim_{x \rightarrow 16} \frac{4 - \sqrt{x}}{x-16}$$

$$5 \quad \lim_{x \rightarrow 5} \frac{\sqrt{x-1} + 4}{x-5}$$

6 Find the equation of the tangent line to $y = 2 \sin x$ at $x = \frac{\pi}{3}$

$$7 \quad \frac{d}{dx} \sin^2 3x$$

$$8 \quad \frac{d}{dx} (2x^5 - 3x^4 + 2)^{15}$$

$$9 \quad \frac{d}{dx} \sin(5x^3 - 4x)$$

$$10 \quad \frac{d}{dx} \left[\frac{\sin(3x)}{(2x^3 - 5x + 1)} \right]$$

$$11. \quad \frac{d}{dx} \cos 3x$$

$$12. \quad \frac{d}{dx} \sec x^2$$

$$13. \quad \frac{d}{dx} \sin 2x \cos 2x$$

$$14. \quad \frac{d}{d\theta} = \frac{1}{4} \sin^2 2\theta$$

$$15. \quad \frac{d}{dt} 2 \cot^2(\pi t + 2)$$

$$16. \quad \frac{d}{dx} 3x - 5 \cos(\pi x)^2$$

$$17. \quad \frac{d}{dx} \sin^3 \sqrt{x} + \sqrt[3]{\sin x}$$