

Differentiation, No Chain Rule

(1) Evaluate the following two limits.

$$\lim_{x \rightarrow 3} \frac{\sqrt{x^2 + 7} + \sqrt{3x - 5}}{x + 2} \quad (1)$$

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{2x^2 - x - 3} \quad (2)$$

(2) Evaluate the following three limits.

$$\lim_{x \rightarrow 2} 3 \quad (3)$$

$$\lim_{x \rightarrow \infty} \frac{3x + 2}{x - 5} \quad (4)$$

$$\lim_{x \rightarrow \infty} \frac{x^5 - x^3 + x - 1}{x^6 + 2x^2 + 1} \quad (5)$$

(3) Find the following limits,

$$\lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 9} \quad (6)$$

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 - 8x}}{2x + 1} \quad (7)$$

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{2x^2 - x - 3} \quad (8)$$

$$\lim_{x \rightarrow \infty} \frac{2 + \frac{1}{x+4}}{3 - \frac{1}{x^2}} \quad (9)$$

$$\lim_{x \rightarrow \infty} \frac{x - 2x^3}{(1 + x)^3} \quad (10)$$

$$\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 + 3}}{x + 5} \quad (11)$$

(4) Find the derivatives for the following functions.

$$f(x) = 5x^{\frac{4}{3}} - \frac{2}{3}x^{\frac{3}{2}} + x^2 - 3x + 1 \quad (12)$$

$$f(x) = 2t^2 + \sqrt{t^3} \quad (13)$$

$$f(x) = \frac{2}{x^2} - \frac{3}{x^{\frac{1}{3}}} \quad (14)$$

$$f(x) = \frac{3}{x^3} + \frac{4}{\sqrt{x}} + 1 \quad (15)$$

(5) Differentiate the following functions.

$$f(x) = (2x^2 - 1)(x^3 + 3) \quad (16)$$

$$g(t) = t^3 (\sqrt{t} + 1) \quad (17)$$

(6) Differentiate the following functions.

$$f(z) = \frac{3z^2 + 5z - 2}{3z - 1} \quad (18)$$

$$h(x) = \frac{\sqrt{x}}{x^2 + 1} \quad (19)$$

(7) Differentiate the following functions.

$$f(x) = x^2 \ln x \quad (20)$$

$$g(y) = \ln y^{(5y-2)} \quad (21)$$

$$h(z) = (\ln z)^2 \quad (22)$$

$$f(x) = \log_2 x \quad (23)$$

(8) Differentiate the following functions.

$$f(x) = \frac{21 - 5x - 6x^2}{3 - 2x} \quad (24)$$

$$g(t) = (t^2 + 1)(\pi t - 6) \quad (25)$$

$$h(w) = \left(\frac{1}{\sqrt{x}} - x^3 \right) \ln x^2 \quad (26)$$

$$f(x) = (2x + 1) \left(\sqrt[3]{x^2} + \frac{1}{x^3} \right) \quad (27)$$

(9) Find the equation of the tangent line at P for the function f .

$$f(x) = \frac{x}{2x + 3}, P = \left(1, \frac{1}{5} \right) \quad (28)$$

$$f(x) = 2x^3(3x^4 + x), P = (-2, -736) \quad (29)$$

$$f(x) = (3x + 2)(2x - 5), P = \left(\frac{1}{2}, -14\right) \quad (30)$$

$$f(x) = \sqrt{x} \ln x^3, P = (4, 12 \ln 2) \quad (31)$$