Differentiation, No Chain Rule

(1) Evaluate the following limits.

$$\lim_{x\to 3} = \frac{\sqrt{x^2+7}+\sqrt{3x-5}}{x+2} \tag{1}$$

$$\lim_{x\to -1} \frac{x^2-x-2}{2x^2-x-3} \tag{2}$$

$$\lim_{x\to 2} 3 \tag{3}$$

$$\lim_{x\to\infty} \frac{3x+2}{x-5} \tag{4}$$

$$\lim_{x\to\infty} \frac{x^5-x^3+x-1}{x^6+2x^2+1} \tag{5}$$

$$\lim_{x\to 9} \frac{\sqrt{x}-3}{x-9} \tag{6}$$

$$\lim_{x\to\infty} \frac{\sqrt{x^2-8x}}{2x+1} \tag{7}$$

$$\lim_{x\to -1} \frac{x^2-x-2}{2x^2-x-3} \tag{8}$$

$$\lim_{x\to\infty} \frac{2+\frac{1}{x+4}}{3-\frac{1}{x^2}} \tag{9}$$

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

$$\lim_{x\to\infty} \frac{\sqrt{4x^2+3}}{x+5} \tag{11}$$

(2) Find the derivatives for the following functions.

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

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

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

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

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$$f(x) = (2x^2 - 1)(x^3 + 3) \tag{16}$$

$$g(t) = t^3 \left(\sqrt{t} + 1\right) \tag{17}$$

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

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

$$f(x) = x^2 \ln x \tag{20}$$

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

$$h(z) = (\ln z)^2 \tag{22}$$

$$f(x) = \log_2 x \tag{23}$$

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

$$g(t) = (t^2 + 1)(\pi t - 6) \tag{25}$$

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

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

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

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

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

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

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