

AP Calculus AB
Power Rule Worksheet

Name Key

Differentiate.

$$1) y = \left(\frac{3}{x^5} + \frac{8}{\sqrt[6]{x^5}} - \frac{1}{x^2} \right)$$

$$y = 3x^{-5} + 8x^{-5/6} - x^{-2}$$

$$y' = -15x^{-6} - \frac{20}{3}x^{-11/6} + 2x^{-3}$$

$$2) f(y) = y^3 \left(\sqrt{y} + \frac{1}{\sqrt[4]{y}} + \sqrt[5]{y^2} \right)$$

$$f(y) = y^3 (y^{1/2} + y^{-1/4} + y^{2/5})$$

$$f(y) = y^{7/2} + y^{11/4} + y^{17/5}$$

$$f'(y) = \frac{7}{2}y^{5/2} + \frac{11}{4}y^{7/4} + \frac{17}{5}y^{12/5}$$

$$3) s(t) = \frac{3t^7 - 5t^4 + 9t - 7}{t^3}$$

$$s(t) = (3t^7 - 5t^4 + 9t - 7)t^{-3}$$

$$s(t) = 3t^4 - 5t + 9t^{-2} - 7t^{-3}$$

$$s'(t) = 12t^3 - 5 + -18t^{-3} + 21t^{-4}$$

$$4) y = \frac{x^3 + 5x^2 - 6x + 1}{\sqrt[3]{x^2}}$$

$$y = (x^3 + 5x^2 - 6x + 1)x^{-2/3}$$

$$y = x^{7/3} + 5x^{4/3} - 6x^{1/3} + x^{-2/3}$$

$$y' = \frac{7}{3}x^{4/3} + \frac{20}{3}x^{1/3} - 2x^{-2/3} - \frac{2}{3}x^{-5/3}$$

$$5) g(s) = \frac{s(s+1)^2}{\sqrt{s}}$$

$$g(s) = (s(s^2 + 2s + 1))s^{-1/2}$$

$$g(s) = (s^3 + 2s^2 + s)s^{-1/2}$$

$$g(s) = s^{5/2} + 2s^{3/2} + s^{1/2}$$

$$g'(s) = \frac{5}{2}s^{3/2} + 3s^{1/2} + \frac{1}{2}s^{-1/2}$$

$$6) f(x) = \left(\frac{\sqrt{2x}}{x} - \frac{3}{x^5} \right)$$

$$f(x) = \sqrt{2} \cdot x^{1/2} \cdot x^{-1} - 3x^{-5}$$

$$f(x) = \sqrt{2}x^{-1/2} - 3x^{-5}$$

$$f'(x) = -\frac{\sqrt{2}}{2}x^{-3/2} + 15x^{-6}$$

$$7) y = \left(x^3 + \frac{3x}{\sqrt[7]{x^4}} - \frac{1}{\sqrt[4]{x^3}} + 2 \right)$$

$$y = x^3 + 3x \cdot x^{-4/7} - x^{-3/4} + 2$$

$$y = x^3 + 3x^{3/7} - x^{-3/4} + 2$$

$$y' = 3x^2 + \frac{9}{7}x^{-4/7} + \frac{3}{4}x^{-7/4}$$

$$8) y = x^4 \left(\frac{3}{x^3} + \frac{3x}{x^{1/2}} + 5x^4 - 2x^{-4} \right)$$

$$y = x^4 (3x^{-3} + 3x \cdot x^{-1/2} + 5x^4 - 2x^{-4})$$

$$y = x^4 (3x^{-3} + 3x^{1/2} + 5x^4 - 2x^{-4})$$

$$y = 3x + 3x^{9/2} + 5x^8 - 2x^0$$

$$y' = 3 + \frac{27}{2}x^{7/2} + 40x^7$$

$$9) f(x) = \left(\frac{x^2 - 3x^5 + \sqrt[6]{x^5} + \frac{1}{\sqrt[3]{x}}}{x^2} \right)$$

$$f(x) = (x^2 - 3x^5 + x^{5/6} + x^{-1/3}) x^{-2}$$

$$f(x) = 1 - 3x^3 + x^{-7/6} + x^{-1/3}$$

$$f'(x) = -9x^2 - \frac{7}{6}x^{-13/6} - \frac{1}{3}x^{-4/3}$$

$$10) y = (x+4)^3$$

$$y = (x+4)(x+4)(x+4)$$

$$y = (x^2 + 8x + 16)(x+4)$$

$$y = x^3 + 8x^2 + 16x + 4x^2 + 32x + 64$$

$$y = x^3 + 12x^2 + 48x + 64$$

$$y' = 3x^2 + 24x + 48$$

$$11) y = \left(\frac{12}{x^4} - 16x^7 + x^{-1} + 5\sqrt[3]{x^2} \right)$$

$$y = 12x^{-4} - 16x^7 + x^{-1} + 5x^{2/3}$$

$$y' = -48x^{-5} - 112x^6 - x^{-2} + \frac{10}{3}x^{-1/3}$$

$$12) f(x) = \left(\frac{(x^2 - 6x)^2}{x^{3/8}} \right)$$

$$f(x) = ((x^2 - 6x)(x^2 - 6x)) x^{-3/8}$$

$$f(x) = (x^4 - 12x^3 + 36x^2) x^{-3/8}$$

$$f(x) = x^{29/8} - 12x^{21/8} + 36x^{13/8}$$

$$f'(x) = \frac{29}{8}x^{21/8} - \frac{63}{2}x^{13/8} + \frac{117}{2}x^{5/8}$$