

Differentiation 1 : Power Rule : Answers

$$1) \frac{dy}{dx} = 8x^7$$

$$2) \frac{dy}{dx} = 5x^4 + 7x^6$$

$$3) \frac{dy}{dx} = 6x^5 - 4x^3$$

$$4) f'(x) = 9x^8 - 7x^6$$

$$5) f'(x) = 6x^2$$

$$6) f'(x) = -15x^4$$

$$7) \text{ Let } y = -2x^3 + 3x^2$$

$$\frac{dy}{dx} = -6x^2 + 6x$$

$$8) \text{ Let } y = 4x^5 + 2x^2$$

$$\frac{dy}{dx} = 20x^4 + 4x$$

$$9) \text{ Let } y = 3x^5 - 2x^2$$

$$\frac{dy}{dx} = 15x^4 - 4x$$

$$10) \frac{dy}{dx} = 8$$

$$11) \frac{dy}{dx} = -3$$

$$12) \frac{dy}{dx} = 0$$

$$13) f'(x) = -6x + 4$$

$$14) f'(x) = 18x^2 - 7$$

$$15) \frac{dy}{dx} = 0$$

$$16) f'(x) = 0$$

$$17) f'(x) = 8$$

$$18) \frac{dy}{dx} = 2x$$

$$19) \frac{dy}{dx} = 9x^2 + 4x - 7$$

$$20) f'(x) = -12x^2 + 7$$

$$21) \text{ Let } y = 2x^3 - 3x^2 + x - 2$$

$$\frac{dy}{dx} = 6x^2 - 6x + 1$$

$$22) \text{ Let } y = 8 - 7x - 2x^2$$

$$\frac{dy}{dx} = -7 - 4x$$

$$23) y = x^{-2}$$

$$\frac{dy}{dx} = -2x^{-3}$$

$$= -\frac{2}{x^3}$$

$$24) y = x^{-3}$$

$$\frac{dy}{dx} = -3x^{-4}$$

$$= -\frac{3}{x^4}$$

$$25) y = x^{-7} \text{ given}$$

$$\frac{dy}{dx} = -7x^{-8}$$

leave as negative power

$$26) f(x) = 2x^{-5}$$

$$f'(x) = -10x^{-6}$$

$$= -\frac{10}{x^6}$$

$$27) f(x) = 3x + 3x^{-2}$$

$$f'(x) = 3 - 6x^{-3}$$

$$f'(x) = 3 - \frac{6}{x^3}$$

$$28) f(x) = -5x^{-1}$$

$$= 5x^{-2}$$

$$= \frac{5}{x^2}$$

$$29) \text{ Let } y = 2x^{-1} + 3x^{-2}$$

$$\frac{dy}{dx} = -2x^{-2} - 6x^{-3}$$

$$= -\frac{2}{x^2} - \frac{6}{x^3}$$

$$30) \text{ Let } y = -3x^{-2} + 4x^{-3}$$

$$\frac{dy}{dx} = 6x^{-3} - 12x^{-4}$$

$$= \frac{6}{x^3} - \frac{12}{x^4}$$

$$31) \text{ Let } y = \frac{7}{x^4} - \frac{2}{x^3}$$

$$\frac{dy}{dx} =$$

$$31) y = 7x^{-4} - 2x^{-3}$$

$$\frac{dy}{dx} = -28x^{-5} + 6x^{-4}$$

$$32) y = x^3 + x^2 + x + 1 + x^{-1} + x^{-2}$$

$$\frac{dy}{dx} = 3x^2 + 2x + 1 - x^{-2} - x^{-3}$$

$$= 3x^2 + 2x + 1 - \frac{1}{x^2} - \frac{1}{x^3}$$

$$33) y = x^{1/2}$$

$$\frac{dy}{dx} = \frac{1}{2} x^{-1/2}$$

$$= \frac{1}{2\sqrt{x}}$$

$$34) y = x^{1/3}$$

$$\frac{dy}{dx} = \frac{1}{3} x^{-2/3}$$

$$= \frac{1}{3\sqrt[3]{x^2}}$$

$$35) y = x^{1/5}$$

$$\frac{dy}{dx} = \frac{1}{5} x^{-4/5}$$

$$= \frac{1}{5\sqrt[5]{x^4}}$$

$$36) f(x) = x^{1/7}$$

$$f'(x) = \frac{1}{7} x^{-6/7}$$

$$37) f(x) = x^2 + x^{1/2}$$

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

$$= 2x + \frac{1}{2\sqrt{x}}$$

$$38) f(x) = x^{-1} + x^{1/2}$$

$$= -x^{-2} + \frac{1}{2} x^{-1/2}$$

$$= -\frac{1}{x^2} + \frac{1}{2\sqrt{x}}$$

$$39) \text{ Let } y = x^{3/2}$$

$$\frac{dy}{dx} = \frac{3}{2} x^{1/2}$$

$$40) \text{ Let } y = x^{5/3}$$

$$\frac{dy}{dx} = \frac{5}{3} x^{2/3}$$

$$41) \text{ Let } y = x^{-2/3}$$

$$\frac{dy}{dx} = -\frac{2}{3} x^{-5/3}$$

$$42) y = x^{3/2}$$

$$\frac{dy}{dx} = \frac{3}{2} x^{1/2}$$

$$= \frac{3\sqrt{x}}{2}$$

$$43) y = x^{4/3}$$

$$\frac{dy}{dx} = \frac{4}{3} x^{1/3}$$

$$= \frac{4\sqrt[3]{x}}{3}$$

$$44) \quad y = x^{-1/2}$$

$$\frac{dy}{dx} = -\frac{1}{2} x^{-3/2}$$

$$= -\frac{1}{2\sqrt{x^3}}$$

$$45) \quad f(x) = 2x^{1/2}$$

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

$$= \frac{1}{\sqrt{x}}$$

$$46) \quad y = -3x^{-1/2}$$

$$\frac{dy}{dx} = -\frac{3}{2} x^{-3/2}$$

$$= -\frac{3}{2\sqrt{x^3}}$$

$$47) \quad y = 2x^{-2/3}$$

$$\frac{dy}{dx} = -\frac{4}{3} x^{-5/3}$$

$$= -\frac{4}{3\sqrt[3]{x^5}}$$

$$48) \quad f(x) = x^{1/2} - x^{-1/2}$$

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

$$= \frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{x^3}}$$

$$49) \quad y = 3x^{-1/2} - x^{1/3} + 2x^{-4/3}$$

$$\frac{dy}{dx} = -\frac{3}{2}x^{-3/2} - \frac{1}{3}x^{-2/3} - \frac{8}{3}x^{-7/3}$$

$$= -\frac{3}{2\sqrt{x^3}} - \frac{1}{3\sqrt[3]{x^2}} - \frac{8}{3\sqrt[3]{x^7}}$$

$$50) \quad y = 6x^2 + 4x - 3x - 2$$

$$y = 6x^2 + x - 2$$

$$\frac{dy}{dx} = 12x + 1$$

$$51) \quad y = 16 - 24x + 9x^2$$

$$\frac{dy}{dx} = -24 + 18x$$

$$52) \quad f(x) = x^5 - x^2 + 3x^3 - 3$$

$$f'(x) = 5x^4 - 2x + 9x^2$$

$$53) \quad f(x) = 6x^3 - 4x^2 - 3x^2 + 2x$$

$$f'(x) = 18x^2 - 8x - 6x + 2$$

$$= 18x^2 - 14x + 2$$

$$54) \quad y = 4x^6 + x^4 + 4x^5$$

$$\frac{dy}{dx} = 24x^5 + 4x^3 + 20x^4$$

$$55) \quad y = x - \sqrt{x} + \sqrt{x} - 1$$

$$y = x - 1$$

$$\frac{dy}{dx} = 1$$

$$\begin{aligned}
 56) \quad f(x) &= (x^{\frac{1}{2}} + x')(x^{\frac{1}{2}} - x') \\
 f(x) &= x - x^{\frac{3}{2}} + x^{\frac{3}{2}} - x^2 \\
 &= x - x^2 \\
 f'(x) &= 1 - 2x
 \end{aligned}$$

$$\begin{aligned}
 57) \quad f(x) &= (2x^{-1} + 3)(3x' - x^{-2}) \\
 f(x) &= 6 - 2x^{-3} + 9x - 3x^{-2} \\
 f'(x) &= 6x^{-4} + 9 + 6x^{-3} \\
 f'(x) &= \frac{6}{x^4} + 9 + \frac{6}{x^3}
 \end{aligned}$$

$$\begin{aligned}
 58) \quad y &= (x^3 + x^{\frac{1}{2}})(x^{-1} - x^{-2}) \\
 y &= x^2 - x' + x^{-\frac{1}{2}} - x^{-\frac{3}{2}} \\
 \frac{dy}{dx} &= 2x - 1 - \frac{1}{2}x^{-\frac{3}{2}} + \frac{3}{2}x^{-\frac{5}{2}} \\
 &= 2x - 1 - \frac{1}{2\sqrt{x^3}} + \frac{3}{2\sqrt{x^5}}
 \end{aligned}$$