

(2) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt} = m v a$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = \frac{d}{dt} (m v) v = \frac{d}{dt} (m v) v + m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m a v + m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt} + m v \frac{dv}{dt} = 2 m v \frac{dv}{dt}$

(a) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(b) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(c) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(i) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(ii) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(d) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(e) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(f) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$
 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(3) $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = m v \frac{dv}{dt}$

(ii) $\frac{1}{x^2} = x^{-2}$, $\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}$
 $\frac{d}{dx} \frac{1}{x^2} = -\frac{2}{x^3}$

(iii) $\frac{d}{dx} x^2 = 2x$

(iv) $\frac{d}{dx} x^3 = 3x^2$

(2) $\frac{d}{dx} x^4 = 4x^3$
 $\frac{d}{dx} x^5 = 5x^4$
 $\frac{d}{dx} x^6 = 6x^5$
 $\frac{d}{dx} x^7 = 7x^6$
 $\frac{d}{dx} x^8 = 8x^7$
 $\frac{d}{dx} x^9 = 9x^8$
 $\frac{d}{dx} x^{10} = 10x^9$

(3) $\frac{d}{dx} x^{-1} = -x^{-2} = -\frac{1}{x^2}$
 $\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}$
 $\frac{d}{dx} x^{-3} = -3x^{-4} = -\frac{3}{x^4}$
 $\frac{d}{dx} x^{-4} = -4x^{-5} = -\frac{4}{x^5}$
 $\frac{d}{dx} x^{-5} = -5x^{-6} = -\frac{5}{x^6}$
 $\frac{d}{dx} x^{-6} = -6x^{-7} = -\frac{6}{x^7}$
 $\frac{d}{dx} x^{-7} = -7x^{-8} = -\frac{7}{x^8}$
 $\frac{d}{dx} x^{-8} = -8x^{-9} = -\frac{8}{x^9}$
 $\frac{d}{dx} x^{-9} = -9x^{-10} = -\frac{9}{x^{10}}$
 $\frac{d}{dx} x^{-10} = -10x^{-11} = -\frac{10}{x^{11}}$

(4) $\frac{d}{dx} x^{-11} = -11x^{-12} = -\frac{11}{x^{12}}$
 $\frac{d}{dx} x^{-12} = -12x^{-13} = -\frac{12}{x^{13}}$
 $\frac{d}{dx} x^{-13} = -13x^{-14} = -\frac{13}{x^{14}}$
 $\frac{d}{dx} x^{-14} = -14x^{-15} = -\frac{14}{x^{15}}$
 $\frac{d}{dx} x^{-15} = -15x^{-16} = -\frac{15}{x^{16}}$
 $\frac{d}{dx} x^{-16} = -16x^{-17} = -\frac{16}{x^{17}}$
 $\frac{d}{dx} x^{-17} = -17x^{-18} = -\frac{17}{x^{18}}$
 $\frac{d}{dx} x^{-18} = -18x^{-19} = -\frac{18}{x^{19}}$
 $\frac{d}{dx} x^{-19} = -19x^{-20} = -\frac{19}{x^{20}}$
 $\frac{d}{dx} x^{-20} = -20x^{-21} = -\frac{20}{x^{21}}$

(5) $\frac{d}{dx} x^{-21} = -21x^{-22} = -\frac{21}{x^{22}}$
 $\frac{d}{dx} x^{-22} = -22x^{-23} = -\frac{22}{x^{23}}$
 $\frac{d}{dx} x^{-23} = -23x^{-24} = -\frac{23}{x^{24}}$
 $\frac{d}{dx} x^{-24} = -24x^{-25} = -\frac{24}{x^{25}}$
 $\frac{d}{dx} x^{-25} = -25x^{-26} = -\frac{25}{x^{26}}$
 $\frac{d}{dx} x^{-26} = -26x^{-27} = -\frac{26}{x^{27}}$
 $\frac{d}{dx} x^{-27} = -27x^{-28} = -\frac{27}{x^{28}}$
 $\frac{d}{dx} x^{-28} = -28x^{-29} = -\frac{28}{x^{29}}$
 $\frac{d}{dx} x^{-29} = -29x^{-30} = -\frac{29}{x^{30}}$
 $\frac{d}{dx} x^{-30} = -30x^{-31} = -\frac{30}{x^{31}}$

34. $\frac{1}{x^2} = x^{-2}$ $\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}$
 $\frac{d}{dx} \frac{1}{x^2} = -\frac{2}{x^3}$

Chapter VII - Derivatives of Functions

35. (1) $y = x^2 + 3x - 5$ $\frac{d}{dx} (x^2 + 3x - 5) = 2x + 3$
 $\frac{d}{dx} (x^2 + 3x - 5) = 2x + 3$

(2) $y = x^3 + 2x^2 - 4x + 7$ $\frac{d}{dx} (x^3 + 2x^2 - 4x + 7) = 3x^2 + 4x - 4$
 $\frac{d}{dx} (x^3 + 2x^2 - 4x + 7) = 3x^2 + 4x - 4$

(3) $y = 5x^4 - 2x^3 + x^2 - 8x + 9$ $\frac{d}{dx} (5x^4 - 2x^3 + x^2 - 8x + 9) = 20x^3 - 6x^2 + 2x - 8$
 $\frac{d}{dx} (5x^4 - 2x^3 + x^2 - 8x + 9) = 20x^3 - 6x^2 + 2x - 8$

(4) $y = x^5 + 3x^4 - 2x^3 + x^2 - 7x + 1$ $\frac{d}{dx} (x^5 + 3x^4 - 2x^3 + x^2 - 7x + 1) = 5x^4 + 12x^3 - 6x^2 + 2x - 7$
 $\frac{d}{dx} (x^5 + 3x^4 - 2x^3 + x^2 - 7x + 1) = 5x^4 + 12x^3 - 6x^2 + 2x - 7$

36. $y = x^2 + 3x - 5$ $\frac{d}{dx} (x^2 + 3x - 5) = 2x + 3$
 $\frac{d}{dx} (x^2 + 3x - 5) = 2x + 3$

37. $y = x^3 + 2x^2 - 4x + 7$ $\frac{d}{dx} (x^3 + 2x^2 - 4x + 7) = 3x^2 + 4x - 4$
 $\frac{d}{dx} (x^3 + 2x^2 - 4x + 7) = 3x^2 + 4x - 4$