

# Calculus - Related Rates

w.s. #1

$$\textcircled{1} 2y \frac{dy}{dt} - 24x^2 \frac{dx}{dt} = 0$$

$$6 \frac{dy}{dt} - 24(4)(-4) = 0$$

$$6 \frac{dy}{dt} + 384 = 0$$

$$\frac{dy}{dt} = \frac{-384}{6}$$

$$= \boxed{-64}$$

$$\textcircled{2} 2y \frac{dx}{dt} + 2x \frac{dy}{dt} - 5 \frac{dx}{dt} + 9y^2 \frac{dy}{dt} = 0$$

$$(-4)(-6) + 6 \frac{dy}{dt} - 5(-6) + 36 \frac{dy}{dt} = 0$$

$$24 + 42 \frac{dy}{dt} + 30 = 0$$

$$\frac{dy}{dt} = \frac{-54}{42}$$

$$= \boxed{\frac{-9}{7}}$$

$$\textcircled{3} \left( 2x \frac{dx}{dt} + \frac{dy}{dt} \right) (x-y) - (x^2+y) \left( \frac{dx}{dt} - \frac{dy}{dt} \right) = 0$$

$$\left( (8)(2) + \frac{dy}{dt} \right) (4-2) - (16+2) \left( 2 - \frac{dy}{dt} \right) = 0$$

$$32 + 2 \frac{dy}{dt} - 36 + 18 \frac{dy}{dt} = 0$$

$$20 \frac{dy}{dt} = 4$$

$$\frac{dy}{dt} = \frac{4}{20} = \frac{1}{5}$$

AK

$$\textcircled{4} \frac{dx}{dt} e^y + x e^y \frac{dy}{dt} = 0 - 0 + \frac{1}{x} \cdot \frac{dx}{dt}$$

$$6e^0 + 2e^0 \frac{dy}{dt} = \frac{1}{2} \textcircled{6}$$

$$6 + 2 \frac{dy}{dt} = 3$$

$$\frac{dy}{dt} = \frac{-3}{2}$$

$$\textcircled{5} 24y^2 \frac{dy}{dt} + 2x \frac{dx}{dt} = 0$$

$$24(1) \frac{dy}{dt} + 2(3)(2) = 0$$

$$24 \frac{dy}{dt} = -12$$

$$\frac{dy}{dt} = -\frac{1}{2}$$

$$\textcircled{6} 12x^2 \frac{dx}{dt} - \left( 6y^2 \frac{dx}{dt} + 12xy \frac{dy}{dt} \right) + 6y \frac{dy}{dt} = 0$$

$$12(9)(3) - \left[ 6(16)(3) + 12(-3)(4) \frac{dy}{dt} \right] + 6(4) \frac{dy}{dt} = 0$$

$$324 - 288 + 144 \frac{dy}{dt} + 24 \frac{dy}{dt} = 0$$

$$168 \frac{dy}{dt} = -36$$

$$\frac{dy}{dt} = \frac{-36}{168} = -\frac{3}{14}$$

$$\textcircled{1} \frac{(3y^2 \frac{dy}{dt} - 8x \frac{dx}{dt})(x^3 + 2y) - (y^3 - 4x^2)(3x^2 \frac{dx}{dt} + 2 \frac{dy}{dt})}{(x^2 + 2y)^2} = 0$$

$$\frac{[3(4)(\frac{dy}{dt}) - 8(-3)(5)][(-27 + 2(-2))] - [-8 - 4(9)][3(9)(5) + 2 \frac{dy}{dt}]}{(9 + -4)^2} = 0$$

$$\frac{(12 \frac{dy}{dt} + 120)(-31) - (-44)(135 + 2 \frac{dy}{dt})}{25} = 0$$

$$-372 \frac{dy}{dt} - 3720 + 5940 + 88 \frac{dy}{dt} = 0$$

$$-284 \frac{dy}{dt} = -2220$$

$$\boxed{\frac{dy}{dt} = \frac{2220}{284} = \frac{555}{71}}$$

$$\textcircled{21} T = 76 \quad \frac{dT}{dt} = 8 \quad \frac{dC}{dt} = ?$$

$$\frac{dC}{dt} = \frac{1}{5}(T - 60) \frac{dT}{dt}$$

$$\frac{dC}{dt} = \frac{1}{5}(76 - 60)(8) = \frac{16 \cdot 8}{5} = \boxed{\frac{128}{5}}$$