Quiz 4.4

Name

1. Let x and y be functions of time t such that the sum of x and y is constant. Which of the following equations describes the relationship between the rate of change of x with respect to time and the rate of change of y with respect to time?

(A) $\frac{dx}{dt} = \frac{dy}{dt}$

(B) $\frac{dx}{dt} = -\frac{dy}{dt}$

(C) $\frac{dx}{dt} + \frac{dy}{dt} = \frac{dK}{dt}$, where K is a function of t

(D) $\frac{dx}{dt} + \frac{dy}{dt} = K$, where K is a function of t

2. Boyle's law states that if the temperature of an ideal gas is held constant, then the pressure P of the gas and its volume V satisfy the relationship $P = \frac{k}{V}$, where k is a constant. Which of the following best describes the relationship between the rate of change, with respect to time t, of the pressure and the rate of change, with respect to time t, of the volume?

(A) $\frac{dP}{dt} = \frac{k}{\left(\frac{dV}{dt}\right)}$

(B) $\frac{dP}{dt} = \frac{-k}{\left(\frac{dV}{dt}\right)}$

(C) $\frac{dP}{dt} = \frac{k}{V^2}\left(\frac{dV}{dt}\right)$

(D) $\frac{dP}{dt} = \frac{-k}{V^2}\left(\frac{dV}{dt}\right)$

3. A right triangle has base x feet and height h feet, where x is constant and h changes with respect to time t, measured in seconds. The angle θ, measured in radians, is defined by $\tan\theta = \frac{h}{x}$. Which of the following best describes the relationship between $\frac{d\theta}{dt}$, the rate of change of θ with respect to time, and $\frac{dh}{dt}$, the rate of change of h with respect to time?

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(A) $\frac{d\theta}{dt} = \left(\frac{x}{x^2+h^2}\right)\frac{dh}{dt}$ radians per second

(B) $\frac{d\theta}{dt} = \left(\frac{x^2}{x^2+h^2}\right)\frac{dh}{dt}$ radians per second

(C) $\frac{d\theta}{dt} = \left(\frac{1}{\sqrt{x^2+h^2}}\right)\frac{dh}{dt}$ radians per second

(D) $\frac{d\theta}{dt} = \tan^{-1}\left(\frac{1}{x}\frac{dh}{dt}\right)$ radians per second