Answer on Question #42100 – Physics - Mechanics | Kinematics | Dynamics

the relation between time t and distance x is t = ax square + bx where a and b are constants.find acceleration ?

Solution:

$$t = ax^2 + bx$$

Differentiate both side with respect to time t ($velocity$ $v = \frac{dx}{dt}$):

$$\frac{dt}{dt} = 2ax\frac{dx}{dt} + b\frac{dx}{dt}$$

$$1 = 2ax \cdot v + b \cdot v$$

$$v = \frac{1}{2ax + b} = (2ax + b)^{-1}$$

Again differentiate both side with respect to time t ($acceleration$ $a = \frac{dv}{dt}$)

$$\frac{dv}{dt} = -2a\frac{dx}{dt}(2ax + b)^{-2} = -\frac{2a \cdot v}{(2ax + b)^2} = -\frac{2a}{(2ax + b)^3} = a$$

Answer: acceleration is equal to $-\frac{2a}{(2ax+b)^3}$