For the 2nd derivative $\frac{d^2y}{dx^2}$:

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d/dt}{dx/dt}\left(\frac{dy/dt}{dx/dt}\right)$$

$$= \frac{1}{(dx/dt)}\,\frac{d}{dt}\left(\frac{dy/dt}{dx/dt}\right)$$

↗ use the quotient rule

$$= \frac{1}{(dx/dt)}\left[\frac{\frac{d^2y}{dt^2}\frac{dx}{dt} - \frac{dy}{dt}\frac{d^2x}{dt^2}}{(dx/dt)^2}\right]$$

Don't memorize the formula, just the principle.