Assignment 13 Problem Two

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2. A curve is defined by parametric equations $x = 2t^2 + 3, y = t^4$

(a) Find the equation of the line tangent at $t = -1$

(b) Find the value of $\frac{d^2y}{dx^2}$ at $t = -1$

(a)

$x = 2t^2 + 3$

$\frac{dx}{dt} = 4t$

$y = t^4$

$\frac{dy}{dt} = 4t^3$

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{4t^3}{4t} = t^2$

$y - y_1 = m(x - x_1)$

When $t = -1$, $m = 1$, $x = 5$, and $y = 1$

Therefore the equation of the line tangent at $t = -1$ is:

$y - 1 = 1(x - 5)$

$y = x - 4$

(b)

$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}(\frac{dy}{dx})}{\frac{dx}{dt}} = \frac{\frac{d}{dt}(t^2)}{4t} = \frac{2t}{4t} = \frac{1}{2}$

The value of the second order derivative is going to be $\frac{1}{2}$ regardless of the initial value of t.