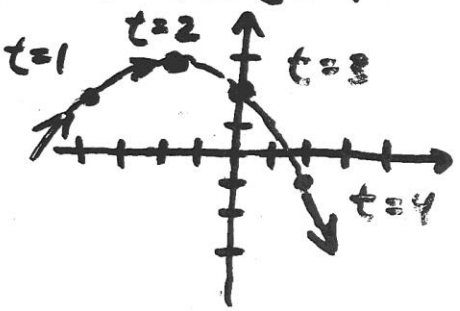
10.1 PARAMETRIC FUNCTIONS

$X = 2t - 6 \qquad Y = 4t - t^2 - 1 \qquad 1 \le t \le 4$

t	X	Y
1	-4	2
2	-2	3
3	0	2
4	2	-1



$\frac{dY}{dt}(t)$

$$\frac{dY}{dx} = \frac{dY/dt}{dx/dt} = \frac{4-2t}{2} = 2 - t$$

SLOPE AT $t = 1 = 2 - 1 = 1$

$$\frac{d^2Y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dY}{dx}(t)\right)}{dx/dt}$$

BOOK SAYS: $\frac{dY'}{dt} \Big/ \frac{dx}{dt}$

$$= \frac{\frac{d}{dt}(2-t)}{dx/dt} = \frac{-1}{2}$$

CONCAVE DOWN ALWAYS.

HORIZONTAL TANGENT WHEN $\frac{dY}{dt} = 0$

VERTICAL TANGENT WHEN $\frac{dx}{dt} = 0$

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10.1 Arc Length = L

$x = f(t) \quad y = g(t) \quad a \le t \le b$

$$L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

From Previous Overhead $x = 2t - 6$

$\frac{dx}{dt} = 2 \quad \frac{dy}{dt} = 4 - 2t \quad y = 4t - t^2 - 1$

$1 \le t \le 4$

$$L = \int_1^4 \sqrt{2^2 + (4-2t)^2}\, dt = 8.211 \text{ (TI-89)}$$

From graph, this looks right.

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