2) Use the parametric function to answer these questions.

$x(t) = t^2 - 3t - 4$
$y(t) = t^3 - 4t^2 + 12t$

$\frac{dx}{dt} = 2t - 3$ $\frac{dy}{dt} = 3t^2 - 8t + 12$

A) Find the point(s) where the tangent lines are horizontal.

want $\frac{dy}{dt} = 0$

$3t^2 - 8t + 12 = 0$

$t = \frac{8 \pm \sqrt{64 - 4(3)(12)}}{6} = \frac{8 \pm \sqrt{-80}}{6}$

Thus there are not point where the tangent line is horizontal.

B) Find the point(s) where the tangent lines are vertical.

want $\frac{dx}{dt} = 0$

$2t - 3 = 0$

$t = \frac{3}{2}$

$x\left(\frac{3}{2}\right) = -6.25$

$y\left(\frac{3}{2}\right) = 12.375$

2) Use the parametric function to answer these questions.

$x(t) = t^2 - 3t - 4$
$y(t) = t^3 - 4t^2 + 12t$

C) find $\left.\frac{dy}{dx}\right|_{(-6,16)}$ =

The first step is to find the value of t that gives the point (-6,16).

$t^2 - 3t - 4 = -6$

$t^2 - 3t + 2 = 0$

$(t-2)(t-1)$

$t = 2 \quad t = 1$

$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{3t^2 - 8t + 12}{2t - 3}$

now check to see if these values of t work to give a 16 for y.

~~$y(1) = 1 - 4 + 12 = 9$~~

$y(2) = 8 - 16 + 24$
$= 32 - 16 = 16$ ✓

$\left.\frac{dy}{dx}\right|_{(-6,16)} = \left.\frac{dy}{dx}\right|_{t=2} = \frac{3(2)^2 - 8(2) + 12}{2(2) - 3}$

$= \frac{12 - 16 + 12}{1} = 8$