3. Consider the parametric curve C: \[
\begin{align*}
x &= t^3 - 3t \\
y &= t^3 - 12t.
\end{align*}
\]

(2+4 pts.) a) Find \( y'(x) \) and \( y''(x) \).

\[
y'(x) = \frac{\beta(t^2 - 4)}{\beta(t^2 - 1)}
\]

\[
y''(x) = \frac{d}{dt} \left( y'(x) \right) = \frac{2t(t^2 - 1) - 2t(t^2 - 4)}{3(t^2 - 1)^2} = \frac{2t}{(t^2 - 1)^3}
\]

(4 pts.) b) Find the points on C where the tangent line is vertical.

\[t = \pm 1\]

(4 pts.) c) Find the points on C where the tangent line is horizontal.

\[t = \pm 2\]

(6 pts.) d) Find the points on the curve C where the tangent line is parallel to the secant line joining the points \( P_1(-2,-11) \) where \( t = 1 \), and \( P_2(2,-16) \) where \( t = 2 \).

\[C : \begin{align*}
&x = f(t) \\
y = g(t)
\end{align*}
\]

Find \( t \in [-2, 2] \) s.t.

\[
\frac{g(2) - g(1)}{f(2) - f(1)} = \frac{c^2 + 4}{c^2 - 1}.
\]

Then

\[
-\frac{5}{4}
\]

\[C_{1, 2} = \pm \frac{2}{\sqrt{3}}
\]