Quiz #4
Math 221

Instructions. Be sure to show your work and explain your reasoning for full credit.

NAME __________________________

1. Show that a cubic polynomial \( p(x) = x^3 + cx + d \) has two points where the tangent lines are horizontal only when \( c < 0 \). Here are some examples when \( c = -1, 0 \) and \( +1 \).

\[
\begin{align*}
\text{Graph 1:} & \quad x^3 - x^2 + 1 \\
\text{Graph 2:} & \quad x^3 + 0x + 1 \\
\text{Graph 3:} & \quad x^3 + x + 1
\end{align*}
\]

2. The following are the graphs of a function, its derivative and its second derivative. Which is which?

\[
\begin{align*}
\text{Graph 1:} & \quad f(x) \\
\text{Graph 2:} & \quad f'(x) \\
\text{Graph 3:} & \quad f''(x)
\end{align*}
\]

3. Can it happen that \( f'(a) \neq 0 \) but the derivative of \( (f(x))^2 \) at \( a \) is 0? Explain.