True/False

For each of the following determine if they are True or False. If they are false find a 'simply' example showing it is false, if they are true briefly describe why they are true.

Problem 1. The vertical line test tests whether a curve in the plane is the graph of a function.

Problem 2. Integration and differentiation are inverse processes linked by the Fundamental Theorem of Calculus.

Problem 3. Every one-to-one function has an inverse.

Problem 4. Every exponential function has a doubling time.

Problem 5. We can always plug in $x = c$ to find the limit $\lim_{x\to c} f(x)$ except when the function is not continuous at $x = c$.

Problem 6. Horizontal asymptotes can NEVER have any points in common with the graph of a function.

Problem 7. Vertical asymptotes CAN have common points with the graph of a function.

Problem 8. While a limit $\lim_{x\to c} f(x)$ does not care what happens exactly at $x = c$ because the limit is concerned only with the behavior of $f(x)$ nearby $x = c$, continuity does care about both and wants them to coincide.

Problem 9. A composition of two continuous functions, as long as it is well-defined, is always continuous.

Problem 10. The tangent slope of a function is the limit of infinitely many secant slopes.

Problem 11. When calculating the derivative of a function by the derivative definition, we can never first plug in $h = 0$ because we will inevitably get $\frac{0}{0}$; instead, we must first simplify until we cancel h from top and bottom of the fraction.

Problem 12. If a function is not differentiable at $x = c$, then it cannot be continuous there either.

Problem 13. The second derivative test for concavity is NOT a bullet-proof test because in none of the possible 4 cases can we make any definitive conclusions about the function.

Problem 14. If the first derivative changes its sign, we are absolutely sure that the original function has a local extremum at x_0 too

Problem 15. Using the graph of $f'(x)$, we can sketch many graphs of the possible original functions $f(x)$.

Problem 16. When x0 is not in the domain of $f(x)$, we cannot automatically assume that $f(x)$ has a vertical asymptote there; instead, we need to find out what $\lim_{x\to x_0^+} f(x)$ and $\lim_{x\to x_0^-} f(x)$ are and those could be different or non-existent.