1. Here is an actual quote from an actual article\footnote{http://www.digitaltrends.com/mobile/twitter-user-base-expands-to-284-million-but-growth-slows/}: “Twitter user base expands to 284 million, but growth slows.” If \( T(t) \) denotes the number of twitter users at time \( t \), where \( t \) is measured in years, what can you say about \( T(2016) \)? What can you say about \( T'(2016) \)? What can you say about \( T''(2016) \)?

2. Sketch the graph of a single function \( f \) satisfying all of the following properties:
   (a) \( f'(x) > 0 \) for all \( x \)
   (b) \( f''(x) < 0 \) for \( x < -1 \)
   (c) \( f''(x) > 0 \) for \( x > -1 \)

3. Sketch the graph of a single function \( g \) that satisfies all of the above conditions:
   (a) \( g(x) < 0 \) for all \( x \);
   (b) \( g'(x) > 0 \) for \( x < 0 \);
   (c) \( g'(x) < 0 \) for \( x > 0 \);
   (d) \( g''(x) > 0 \) for all \( x < -5 \) and all \( x > 2 \);
   (e) \( g''(x) < 0 \) for all \( x \) between \(-5\) and \(2\).

4. Suppose that \( h \) is a function satisfying the following:
   (a) \( h(3) = 0 \);
   (b) \( h'(3) = 1 \).
   (c) \( h''(x) > 0 \) for all \( x \).

Explain why it is \textit{not} possible that \( h(5) = 1 \).

5. Find all solutions each equation:
   (a) \( 3x + 4 = 2x - 7 \)
   (b) \( x^2 + 3x = 18 \)
   (c) \( x^3 + 2x^2 = 8x \) (NOTE: there are three solutions here. Make sure you find all three.)
   (d) \( x^3e^{-2x} - xe^{-2x} = 0 \)