1. (2 points each) For each of the following, circle all the statements which are **always** true. For the cases below, one statement may be true, **or** both **or** neither of the statements may be true.

(a) Let $x = c$ be an inflection point of $f$. Assume $f'$ is defined at $c$.

- If $L$ is the linear approximation to $f$ near $c$, then $L(x) > f(x)$ for $x > c$.
- The tangent line to the graph of $f$ at $x = c$ is above the graph on one side of $c$ and below the graph on the other side.

(b) The differentiable function $g$ has a critical point at $x = a$.

- If $g''(a) > 0$, then $a$ is a local minimum.
- If $a$ is a local maximum, then $g''(a) < 0$.

(c) The derivative of $g(x) = (e^x + \cos x)^2$ is

- $g'(x) = 2(e^x - \sin x)(e^x + \cos x)$.
- $g'(x) = 2e^{2x} + 2(e^x \cos x - e^x \sin x)$.

(d) A continuous function $f$ is defined on the closed interval $[a, b]$.

- $f$ has a global maximum on $[a, b]$.
- $f$ has a global minimum on $[a, b]$.

(e) Consider the family of functions $e^{-(x-a)^2}$.

- Every function in this family has a critical point at $x = 0$.
- Some function in this family has a local maximum at $x = 2$. 