1. (3 points each) In each of the following, circle **one** of the answers (A)-(E). No explanation necessary.

(a) If \( f \) is differentiable for all \( x \) and has a local maximum at \( x = 3 \), then which of the following **must** be true?

   I. \( f'(3) = 0 \)
   II. \( f''(3) < 0 \)
   III. \( f \) is continuous at \( x = 3 \)

   (A) I only  
   (B) II only  
   (C) I and II only  
   **(D) I and III only**  
   (E) I, II, and III

(b) If \( f \) and \( g \) are differentiable, \( h(x) = f(x) - g(x) \), and \( h(x) \) has a local maximum value at \( x = 3 \), then

   (A) \( f'(x) > g'(x) \)  
   (B) \( f'(3) = g'(3) \)  
   (C) \( f'(3) < g'(3) \)  
   (D) \( f(x) \) has a local maximum value at \( x = 3 \)  
   (E) \( g(x) \) has a local minimum value at \( x = 3 \)

(c) Let \( f(x) = \frac{\sin(x)}{e^x} \) for \( x > 0 \). When the minimum value of \( f(x) \) occurs, then

   (A) \( \sin(x) = 0 \)  
   (B) \( \cos(x) = 0 \)  
   (C) \( \cos(x) = \sin(x) \)  
   (D) \( \cos(x) = -\sin(x) \)  
   (E) \( f(x) \) does not have any extreme values on the interval \([0, \infty)\)

(d) The graph of \( y = x + \frac{1}{x} \) is both increasing and concave down on the interval

   **(A) \((-\infty, -1)\)**  
   (B) \((-1, 0)\)  
   (C) \((0, 1)\)  
   (D) \((1, \infty)\)  
   (E) never