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 $f(x) = \dfrac{\sin(x)}{e^x}$ 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 $y = x + \dfrac{1}{x}$ is both increasing and concave down on the interval

   (A) $(-\infty, -1)$ (B) $(-1, 0)$ (C) $(0, 1)$

   (D) $(1, \infty)$ (E) never