5. [8 points] Each part of this problem has four statements, (i)-(iv). For each part, circle all statements which are always true and draw a line through all other statements. Any ambiguous markings will receive no credit.

a. [4 points] Let \( q(t) = A \cos(Bt) + C \sin(Bt) \), with \( A, B, \) and \( C \) constants.

(i) \[ q''(t) = -B^2q(t). \]

(ii) The function \( q(t) \) is concave down everywhere.

(iii) The value of \( q'(\frac{\pi}{2B}) \) is \( AB \).

(iv) If \( q'(0) = \pi \) and \( C = 2 \), then \( q(t) = q(t + 4) \) for all values of \( t \).

b. [4 points] Let \( f(x) \) be a function defined on the closed interval \([0, 4]\), such that \( f''(x) > 0 \) on the entire interval, and \( f'(x) \) is zero only at \( x = 3 \).

(i) \( f(1) > f(4) \).

(ii) \( f'(1) < f'(3) \).

(iii) The point \((3, f(3))\) is a local maximum.

(iv) Either one or both of \( f(4) \) and \( f(0) \) are a global maximum.