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) $\boxed{q''(t) = -B^2 q(t).}$

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

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

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

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) $\boxed{f'(1) < f'(3).}$

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

(iv) $\boxed{\text{Either one or both of } f(4) \text{ and } f(0) \text{ are a global maximum.}}$