

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 $q' \left(\frac{\pi}{2B} \right)$ 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.