2.

Suppose that the map f has an N-cycle $\{x_0, x_1, \ldots, x_{N-1}\}$.

So $x_{n+1} = f(x_n)$ for $0 \le n \le N-2$
and $x_0 = f(x_{N-1})$

Let $G(x) = f^N(x)$.

Then $G'(x) = f'(f^{N-1}(x)) \frac{d}{dx} f^{N-1}(x)$

$= f'(f^{N-1}(x))\, f'(f^{N-2}(x)) \frac{d}{dx} f^{N-2}(x)$

Inductively
$G'(x) = f'(f^{(N-1)}(x))\, f'(f^{N-2}(x)) \ldots f'(f(x))\, f'(x)$

If $x \in \{x_0, x_1, \ldots, x_{N-1}\}$ is a point on an N-cycle then the set $\{f^{N-1}(x), f^{N-2}(x), \ldots, f(x), x\}$ is just a reordering of $\{x_0, x_1, \ldots, x_{N-1}\}$.

Hence $G'(x_j) = \prod_{i=0}^{N-1} f'(x_i)$ for any $j \in \{0, 1, \ldots, N-1\}$

So $G'(x)$ is constant on the N-cycle.