EX.1.2.30, Sauer3

Assume that Fixed-Point Iteration is applied to a twice continuously differentiable function $g(x)$ and that $g'(r) = 0$ for a fixed point. Show that if FPI converges to r, the error obeys $\lim_{i\to\infty} e_{i+1}/(e_i)^2 = M$, where $M = |g''(r)|/2$.