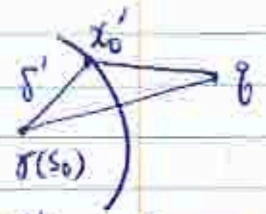
$d(p, x_0') \geq d(p,q) - d(q, x_0')$

$= r - (r - s_0 - \delta') = s_0 + \delta'$

$\uparrow \because s_0 \in A$



$d(q, \gamma(s_0)) = r - s_0$

1st go from q to $\partial B_{\gamma(s_0)}(\delta')$

$\ell($ 

$) = \delta' + s_0$

$\therefore d(p, x_0') = \delta' + s_0$

So  is geodesic $\therefore$ regular

$\therefore \gamma(s_0 + \delta') = x_0'$ $\therefore A$ open

$\therefore A = [0, r]$ $\because r \in A$ $\therefore \gamma(r) = q$

a) $\Rightarrow$ b). A closed, bounded in M

A bounded $\Rightarrow$ $A \subset B_R(p)$. in d

By $(*)$, $\exists\, B_r(0) \subset T_pM$, s.t.

$B_R(p) \subset \exp_p \overline{B_r(0)}$, $\leftarrow$ compact

now A is a closed set in a compact set, $\therefore A$ is compact.

c) $\Rightarrow$ b) If $\{p_n\}$ is Cauchy in d then it is bounded, so closure $\overline{\{p_n\}}$ is compact, $\therefore \exists$ subseq convergent