On an analogue of Gauss–Lucas theorem for a non-convex set on the complex plane

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Let $S(\phi) = \{z : |\arg(z)| \geqslant \phi\}$ be a sector on the complex plane $\mathbb{C}$. If $\phi \geqslant \pi/2$, then $S(\phi)$ is a convex set and, according to the Gauss-Lucas theorem, if a polynomial $p(z)$ has all its zeros on $S(\phi)$, then the same is true for the zeros of all its derivatives. In this paper is proved that if the polynomial $p(z)$ is with real and non-negative coefficients, then the same is true also for $\phi < \pi/2$, when the sector is not a convex set.