Stephanie Edwards* (sedwards@hope.edu), 27 Graves Place, Department of Mathematics,
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Let $F$ be a real polynomial of degree $N$. Then the curvature of $F$ is defined to be

$$\kappa = \frac{F''}{(1 + (F')^2)^{\frac{3}{2}}}.$$

Determining the maximum number of zeros of $\kappa$ is an easy problem: since the zeros of $\kappa$ are the zeros of $F''$, the curvature of $F$ is 0 at most $N - 2$ times. A much more intriguing problem is to determine the maximum number of relative extreme values for the function $\kappa$, or equivalently, determine the maximum number of zeros of $\kappa'$. In 2004 it was shown that if all the zeros of $F''$ are real, then $F$ has at most $N - 1$ points of extreme curvature. We use level sets and auxiliary functions to study the zeros of the derivatives of these functions. We provide a partial solution to this problem, showing that $F$ has at most $N - 1$ points of extreme curvature when $F$ has only simple zeros and when certain geometrical conditions hold. (Received September 06, 2012)