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Modeling of a wide range of physical phenomena leads to tracking fronts moving with curvature-dependent speed. A particularly natural example is where the speed is the mean curvature. If the movement is monotone inwards, then the arrival time function is the time when the front arrives at a given point. It has long been known that this function satisfies a natural differential equation in a weak sense but one wonders what is the regularity. It turns out that one can completely answer this question. It is always twice differentiable and the second derivative is only continuous in very rigid situations that have a simple geometric description. The proof weaves together analysis and geometry. (Received May 22, 2016)