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Illumination by Tangent Lines

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(Submitted on 28 Jul 2011)

Let f be a differentiable function on the real line, and let $P = \{f\} \\ C\} = all$ points not on the graph of f. We say that the illumination index of P, denoted by $I_{f}(P)$, is k if there are k distinct tangents to the graph of f which pass through P. In section 2 we prove results about the illumination index of f with f" (x)\geq 0 on \Re. In particular, suppose that $y=L_1(x)$ and $y=L_2(x)$ are distinct oblique asymptotes of f and let P=(s,t)\in G_{f}^{C} . If $max(L_1(s),L_2(s))$ (s))<t<f(s), then $I_{f}(P)=2$. If $L_1(s)$ \not= $L_2(s)$ and $min(L_1(s),L_1(s))$ <t\leqmax(L_1(s),L_2(s)), then $I_{f}(P)=1$. Finally, if L-leqmin(L_1(s),L_2(s)), then $I_{f}(P)=0$. We also show that any point below the graph of a convex rational function or exponential polynomial

must have illumination index equal to 2. In section 3 we also prove results about the illumination index of polynomials.

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