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Reflective Properties of Mathematical Curves

In this project, experiments were done to represent how light is reflected off of mathematical curves. All of the experiments were done mathematically in an Excel spread sheet. The pattern of light dispersion can be represented by a void curve, which is the boundary between area of no light and an area where the light is reflected. Coefficients were changed in common curves to see how the void curve changed when the light source is held at a constant position. The position of the light source was also a variable being changed to see how it would affect the void curve when the curve is kept constant at a parabola. To change the void curve from a series of points to an equation, Excel has a Trendline finder, which produces coefficients for up to a 6th order polynomial in order to find the best fit line. The coefficients of the curves were then compared to each of the corresponding void curve coefficients to see the relationship. The same comparison was made between the position of the light source and the corresponding void curve coefficients when the curve is held constant. The relationships between the coefficients of the curve and the coefficients of the void curve were proportional and rational in most cases but in some there was no correlation. The relationships between the position of the light source and the corresponding coefficients are more complicated. They could only be represented by Trendline generated polynomials. This project is applicable to many aspects, such as; acoustics in architecture, controlling brightness in a room to certain areas, and creating a tracking device that uses the void curve to find the position an object that is emitting sound or light.