Interactive Nomograms
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no-mo-gram (ˈnä-məˌgrəm, ˈnō-) a graphical representation of a mathematical relation in multiple variables, where each variable is represented by a curve and relations between the variables are derived from straight lines intersecting all curves.

motivation
Nomograms are a very useful tool for visualizing mathematical relations of multiple variables. With nomograms, it is easy to see how changes in one variable affect the value of another variable.

However, most nomograms are static, and it’s up to the user to use a straightedge to manually figure out how the values relate. Additionally, there is currently no easy way to generate nomograms dynamically and intuitively.

solution
Our project aims to add interactivity to nomograms. We built an online tool for users to easily generate nomograms from inputted mathematical relations. The user can then interact with the nomograms to explore relationships between variables.

equation types
\[
\begin{align*}
a \cdot x + b \cdot y + c &= d \cdot z \\
a \cdot x - b \cdot y + c &= d \cdot z \\
c \cdot x^a \cdot b^y &= z^d \\
c \cdot x^a / b^y &= z^d
\end{align*}
\]

implementation
We used regular expressions to parse user input. In order to plot the relations between three variables on straight lines, we transformed the equations to linear equations by taking logarithms, if necessary. To determine the distance between the lines, we looked at the ratios of the coefficients of each variable.

We implemented this visualization in JavaScript using D3.

features
- Free-form user input
- Variety of equation types
- Suggested equations to explore
- Draggable points for each variable
- Customizable variable ranges
- Fixed-variable selection

future work
Possible extensions would be to support nomograms of different shapes and relations with more than three variables.