3-2 Obj: to sketch slope fields of a differential equation.

Ex: Sketch the slope field of \( \frac{dy}{dx} = x^2 y \) at the points indicated.

A slope field is literally a field of slopes. Just find the slopes (\( \frac{dy}{dx} \)) at the indicated points by plugging in the \((x, y)\) values.

\[
\begin{align*}
(1, 0) &= 1^2 \cdot 0 \Rightarrow m = 0 \\
(1, 1) &= 1^2 \cdot 1 \Rightarrow m = 1 \\
(1, -1) &= 1^2 \cdot -1 \Rightarrow m = -1 \\
(0, 0) &= 0^2 \cdot 0 \Rightarrow m = 0 \\
(0, 1) &= 0^2 \cdot 1 \Rightarrow m = 0 \\
(0, -1) &= 0^2 \cdot -1 \Rightarrow m = 0
\end{align*}
\]
A slope field shows the general shape of the general solutions of a differential equation.

For example, following the "flow" of the slopes, the particular solutions at (0,1) and (2, -3) are shown.

Another way to think of it is...

If we solved the differential equation, found the general solution, and then the particular solution at (0,1), the graph of that particular solution would be the shape of the graph above through (0, -1).