The thicker lines displayed around point \( f(1, 2.5) \) are due to the level curves intersecting because of an approximation error. The level curves stop because the gradient is close to zero.

The local minimum and saddle point can be viewed in the contour plot above at the coordinates \( f(2, 2) \) and \( f(0, 0) \) respectively. Mathematically the extrema can be found by:

\[
\begin{align*}
\frac{\partial f}{\partial x} &= 3y^2 + 6x = 0 \\
\frac{\partial f}{\partial y} &= 3x^2 + 6y = 0
\end{align*}
\]

Substitute into \( f_y \):

\[
\begin{align*}
3x^2 &= 6y \\
x^2 &= 2y \\
x &= \sqrt{2y}
\end{align*}
\]

Substitute in \( y \) values into the \( f_x \) gradient to solve the \( x \) values of the local extrema.

\[
\begin{align*}
\frac{\partial f}{\partial x}(0, 0) &= 0 \\
\frac{\partial f}{\partial x}(2, 2) &= -8
\end{align*}
\]

Set \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \) equal to zero.

\[
\begin{align*}
f(0, 0) &= 0 \text{ which is a saddle point.} \\
f(2, 2) &= -8 \text{ which is a local minimum.}
\end{align*}
\]