MA 104

Lesson 50 Extreme Values

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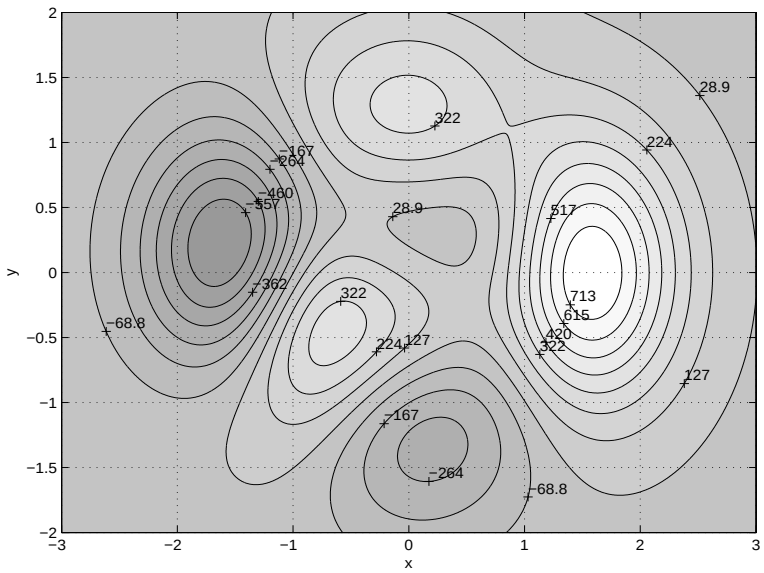
1. Identify the critical points of the function below. Estimate the *critical value* of each critical point. What is the global maximum and the global minimum of the function?



2. Find the critical points of the function $f(x, y) = x^2 - y^2$. Plot the function in Mathematica over the domain $[-2, 2] \times [-2, 2]$.

3. Find the critical points of the function $f(x, y) = x^3y + 12x^2 - 8y$. Use the Second Derivative Test to classify each as a local maximimum, local minimum, or a saddle point.

4. Find the critical points of the function $f(x, y) = x^2 - y^2 + 5e^{-x^2}$.

   (a) Use the Second Derivative Test to classify each as a local maximum, local minimum, or a saddle point. Plot the $f(x, y)$ in Mathematica.

   (b) Find the *global maximum* of $f(x, y)$ on the domain $\{(x, y)| - 2 \leq x \leq 2,\ -2 \leq x \leq 2\}$.

5. Find the point on the plane $x - y + z = 4$ that is closest to the point $(1, 2, 3)$. Keep track of your steps as you go.