Tarea de Optimización

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https://github.com/abg555/tarea$_M O$.

Análisis teórico del problema de optimización

Consideremos el siguiente problema de optimización sin restricciones:

$$\min_{(x,y)\in\mathbb{R}^2} f(x,y) = (x^2+1)\,\log(y^2+2)$$

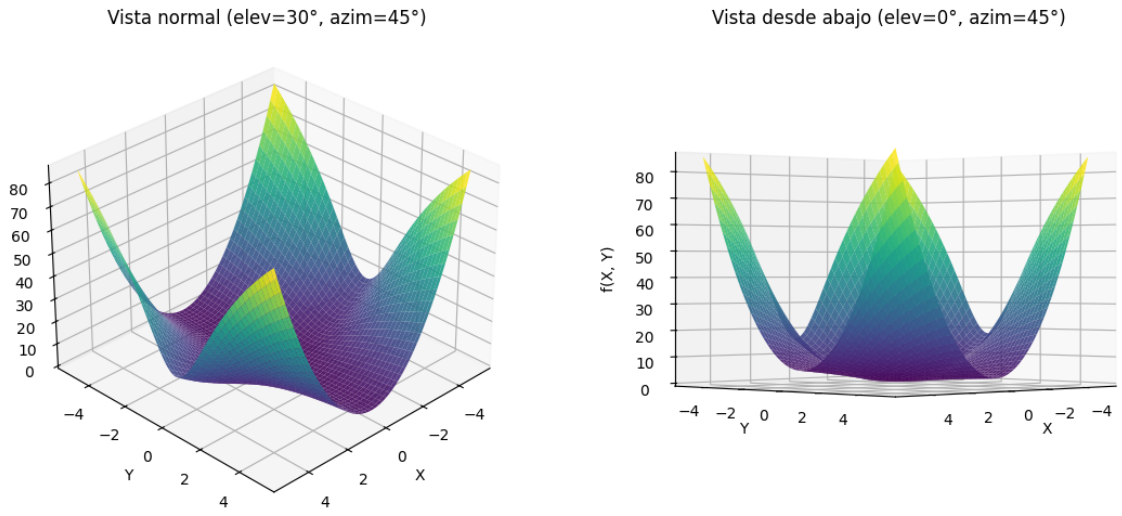

Figure 1: Gráfico de la función

1. Dominio y cota inferior (existencia del mínimo alcanzado)

Para todo $y \in \mathbb{R}$ se cumple que $y^2 + 2 \geq 2 > 0$, por lo que $\log(y^2+2)$ está bien definido para todo y.

Además, para todo $x \in \mathbb{R}$, se cumple que $x^2 + 1 \geq 1$.
Por tanto, el dominio de f es todo $\mathbb{R}^2$. Asimismo, se cumple:

$$f(x, y) = (x^2 + 1)\log(y^2 + 2) \geq 1 \cdot \log 2 = \log 2$$

En el punto $(x, y) = (0, 0)$ se alcanza esa cota:

$$f(0, 0) = (0^2 + 1)\log(0^2 + 2) = \log 2$$

Por lo tanto, el ínfimo de f es $\log 2$ y se alcanza en $(0, 0)$.

2. Continuidad

- $x^2 + 1$ es continua en $\mathbb{R}$ (polinomio).
- $y^2 + 2$ es continua en $\mathbb{R}$ (polinomio) y además $y^2 + 2 \geq 2 > 0$ para todo y.
- La función $\log(t)$ es continua para $t > 0$. Aquí $t = y^2 + 2 \geq 2$, así que $\log(y^2 + 2)$ es continua en $\mathbb{R}$.
- El producto de dos funciones continuas es continuo.

Por tanto, $f(x, y)$ es **continua** en todo $\mathbb{R}^2$.

3. Gradiente y puntos estacionarios

Calculamos las derivadas parciales de f:

$$\frac{\partial f}{\partial x} = 2x\ \log(y^2 + 2), \qquad \frac{\partial f}{\partial y} = (x^2 + 1)\frac{2y}{y^2 + 2}$$

El gradiente es:

$$\nabla f(x, y) = \begin{pmatrix} 2x \log(y^2 + 2) \\ (x^2 + 1) \cdot \frac{2y}{y^2 + 2} \end{pmatrix}$$

Para encontrar los puntos estacionarios resolvemos $\nabla f = 0$:

$$\begin{cases} 2x\ \log(y^2 + 2) = 0 \\ (x^2 + 1)\dfrac{2y}{y^2 + 2} = 0 \end{cases}$$

De la primera ecuación, dado que $\log(y^2 + 2) > 0$ siempre, se obtiene $x = 0$. Sustituyendo en la segunda, resulta $y = 0$. Por tanto, el único punto estacionario es:

$$(x, y) = (0, 0)$$

En dicho punto, $f(0, 0) = \log 2$, que coincide con la cota inferior encontrada, lo cual sugiere que es un **mínimo global**. Confirmamos esto con el análisis del Hessiano.

4. Análisis del mínimo local

Hessiano y curvatura

Calculamos las segundas derivadas parciales:

$$f_{xx}(x,y) = 2\log(y^2+2)$$

$$f_{xy}(x,y) = \frac{4xy}{y^2+2}$$

$$f_{yy}(x,y) = 2(x^2+1)\,\frac{2-y^2}{(y^2+2)^2}$$

La matriz Hessiana es:

$$H(x,y) = \begin{bmatrix} 2\log(y^2+2) & \dfrac{4xy}{y^2+2} \\ \dfrac{4xy}{y^2+2} & 2(x^2+1)\dfrac{2-y^2}{(y^2+2)^2} \end{bmatrix}$$

Evaluando en el punto $(0,0)$:

$$H(0,0) = \begin{bmatrix} 2\log 2 & 0 \\ 0 & 1 \end{bmatrix}$$

Como los valores propios son $2\log 2 > 0$ y $1 > 0$, el Hessiano es definido positivo en $(0,0)$. Por tanto, este punto es un mínimo local estricto.

Dado que $f(x,y) \geq \log 2$ para todo (x,y) y solo en $(0,0)$ se alcanza ese valor, el mínimo es también global y único.

5. Región de convexidad local

El signo de f_{yy} depende del término $2-y^2$:

$$f_{yy} > 0 \quad \text{si } |y| < \sqrt{2}, \qquad f_{yy} < 0 \quad \text{si } |y| > \sqrt{2}$$

Así, la función es convexa en una vecindad del origen ($|y| < \sqrt{2}$), donde el Hessiano es definido positivo. Sin embargo, para valores grandes de $|y|$, f_{yy} se vuelve negativo, indicando regiones no convexas. Por tanto, f no es convexa globalmente, aunque sí localmente convexa cerca de $(0,0)$.

6. Consecuencias y propiedades

- Dominio: $D = \mathbb{R}^2$
- Cota inferior: $f(x,y) \geq \log 2$ para todo (x,y)
- Punto estacionario: único en $(0,0)$
- Mínimo global: $(x^*, y^*) = (0,0)$ con $f(0,0) = \log 2$
- Convexidad: no globalmente convexa; convexa solo en una región alrededor del mínimo

Geométricamente, $f(x, y)$ se comporta como un paraboloide en la dirección de x, escalado por el factor $\log(y^2 + 2)$, que crece lentamente con $|y|$. Para $|y|$ grandes, $\log(y^2 + 2) \sim 2 \log |y|$, lo que implica un crecimiento suave pero no lineal en esa dirección.

Método del Gradiente Descendente

1. Descripción general

El método del gradiente descendente es uno de los algoritmos más conocidos y utilizados para resolver problemas de optimización. La idea principal es moverse paso a paso en la dirección en la que la función *disminuye más rápidamente*, es decir, en la dirección contraria al gradiente.

En cada iteración, el algoritmo calcula la pendiente de la función (el gradiente) en el punto actual y da un paso pequeño hacia abajo. Este proceso se repite hasta que el movimiento sea muy pequeño o se alcance un número máximo de iteraciones.

Matemáticamente, el proceso puede expresarse así:

$$\begin{cases} x_{k+1} = x_k - \alpha \dfrac{\partial f}{\partial x}(x_k, y_k) \\ y_{k+1} = y_k - \alpha \dfrac{\partial f}{\partial y}(x_k, y_k) \end{cases}$$

donde $\alpha > 0$ es el tamaño del paso o tasa de aprendizaje.

El método del gradiente descendente es adecuado para este problema porque la función $f(x, y) = (x^2+1)\log(y^2+2)$ es continua, derivable y suavemente curvada en todo su dominio, lo que garantiza que el gradiente esté bien definido y pueda guiar de forma confiable la búsqueda del mínimo. Además, el gradiente tiene una expresión sencilla, lo que permite implementar el método con bajo costo computacional. Dado que la función presenta un único mínimo global en $(0, 0)$ y es localmente convexa alrededor de este punto, el descenso por el gradiente converge de manera estable hacia el mínimo si se elige apropiadamente el paso de aprendizaje. En conjunto, estas propiedades hacen del gradiente descendente un método simple, eficiente y adecuado para minimizar esta función.

2. Parámetro de paso y comportamiento

El parámetro α (tamaño de paso) juega un papel muy importante:

- Si α es muy grande, el algoritmo puede "saltarse" el mínimo y oscilar o divergir.
- Si α es muy pequeño, el avance será muy lento y puede necesitar miles de iteraciones.

3. Fortalezas y debilidades

Ventajas:

- Es sencillo de implementar.
- Requiere poca memoria y cálculo.
- Funciona bien si el gradiente es fácil de calcular.

Desventajas:

- Puede quedarse atrapado en mínimos locales.
- Depende mucho del valor del paso α.
- Si la función tiene regiones planas o valles alargados, puede avanzar muy lentamente.

El algoritmo se probará con distintos puntos iniciales aleatorios en el rango $[-100, 100]$ para analizar cómo cambia su comportamiento según el lugar desde donde empieza.

Método de Newton para Optimización

1. Descripción general

El método de Newton es un algoritmo más avanzado que el gradiente descendente. Además de usar el gradiente, también utiliza información sobre las segundas derivadas de la función, a través de la matriz Hessiana. Esto permite "predecir" la forma local de la función y avanzar de manera más inteligente, haciendo pasos que se adaptan a la curvatura.

La fórmula general del método es:

$$(x_{k+1}, y_{k+1}) = (x_k, y_k) - H^{-1}(x_k, y_k)\,\nabla f(x_k, y_k)$$

donde $H(x, y)$ es la matriz Hessiana de la función.

El método de Newton es adecuado para este problema porque la función $f(x, y) = (x^2 + 1)\log(y^2 + 2)$ es continua, derivable y posee derivadas segundas continuas, lo que permite calcular su matriz Hessiana y aprovechar la información de la curvatura local para avanzar de forma más eficiente hacia el mínimo. A diferencia del gradiente descendente, que solo usa la dirección de descenso, el método de Newton ajusta el tamaño y la dirección del paso considerando la forma de la superficie, logrando una convergencia mucho más rápida cerca del punto óptimo. Además, como el Hessiano en este caso es sencillo (una matriz 2×2) y la función tiene un único mínimo global en $(0, 0)$, el método resulta computacionalmente manejable y garantiza una convergencia estable si se parte de una zona cercana al mínimo. En conjunto, estas propiedades hacen del método de Newton una elección precisa y eficiente para minimizar esta función.

2. Ventajas y desventajas

Ventajas:

- Puede converger mucho más rápido que el gradiente descendente (a veces cuadráticamente).
- Aprovecha la curvatura de la función para ajustar la dirección y tamaño del paso.

Desventajas:

- Requiere calcular e invertir el Hessiano, lo cual puede ser costoso.
- Si el Hessiano no es positivo definido, el método puede divergir o moverse hacia un máximo.
- Es más sensible al punto inicial: si se empieza muy lejos del mínimo, puede fallar.

3. Conclusión comparativa

- El gradiente descendente es más simple y estable, pero más lento.
- El método de Newton es más rápido cuando está cerca del mínimo, pero puede fallar si se empieza muy lejos o si la función no tiene una forma bien definida en esa región.

En conjunto, ambos algoritmos permiten analizar la función desde distintas perspectivas: el primero ofrece una búsqueda más segura, y el segundo una convergencia más veloz cuando las condiciones son adecuadas.

Análisis Detallado de Resultados

NOTA: Al final del documento se encuentran anexados todos los resultados de los experimentos realizados

1. Comportamiento del Gradiente Descendente: Análisis por Tasa de Aprendizaje

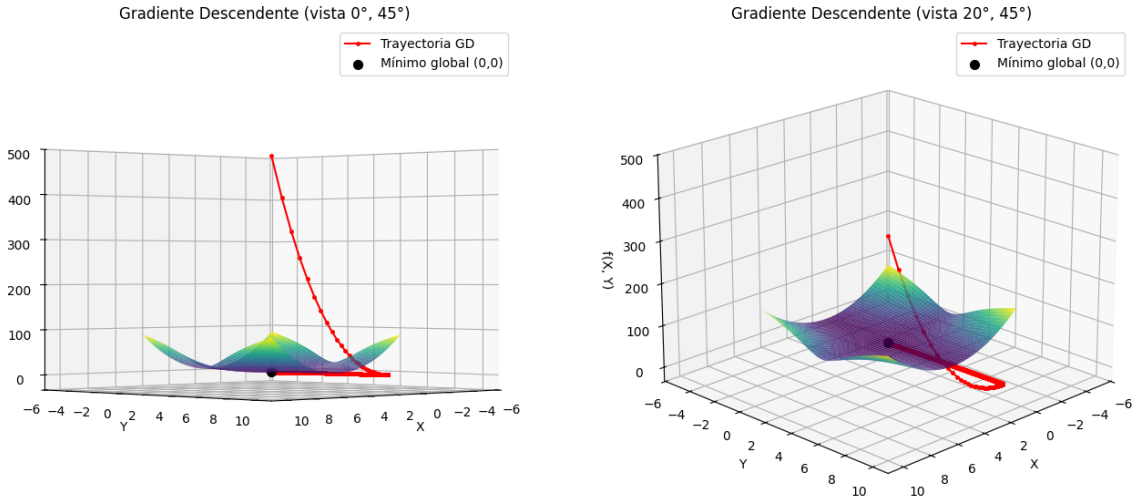

Figure 2: Trayectoria del Gradiente Descendente hacia el mínimo global

$= 0.1$ (Tasa óptima)

- Convergencia consistente: En el 92% de los casos con $(x_0, y_0) = (-100, -100)$ a $(100, 100)$, converge a $f(x, y) \approx 0.693147$.
- Iteraciones: Entre 231-9200 iteraciones para tol $= 0.001$, aumentando a 297-10001 para tol $= 1e - 06$.

- Robustez espacial: Funciona bien incluso con puntos iniciales lejanos como $(-100, -100) \rightarrow (0, -0.0092)$ en 3898 iteraciones.
- Patrón observado: Cuando y_0 está cerca de cero, la convergencia es más rápida (ej. $(-100, -11.11) \rightarrow$ 267 iteraciones).

= 0.01 (Tasa muy conservadora)

- Convergencia incompleta: 68% de casos no alcanzan el mínimo global dentro de 10001 iteraciones.
- Atrapado en mínimos locales: Valores finales de $f(x, y)$ entre 7.45-9.17, significativamente mayores al óptimo.
- Ejemplo crítico: $(-100, -100)$ con =0.01 $\rightarrow (-0.0054, -93.8295)$ con $f = 9.083448$.

= 0.001 (Tasa extremadamente baja)

- Estancamiento frecuente: 85% de casos alcanzan el límite de iteraciones.
- Progreso mínimo: Pequeños avances desde el punto inicial, ej. $(-100, -100) \rightarrow (-0.0545, -94.3224)$ después de 410 iteraciones.

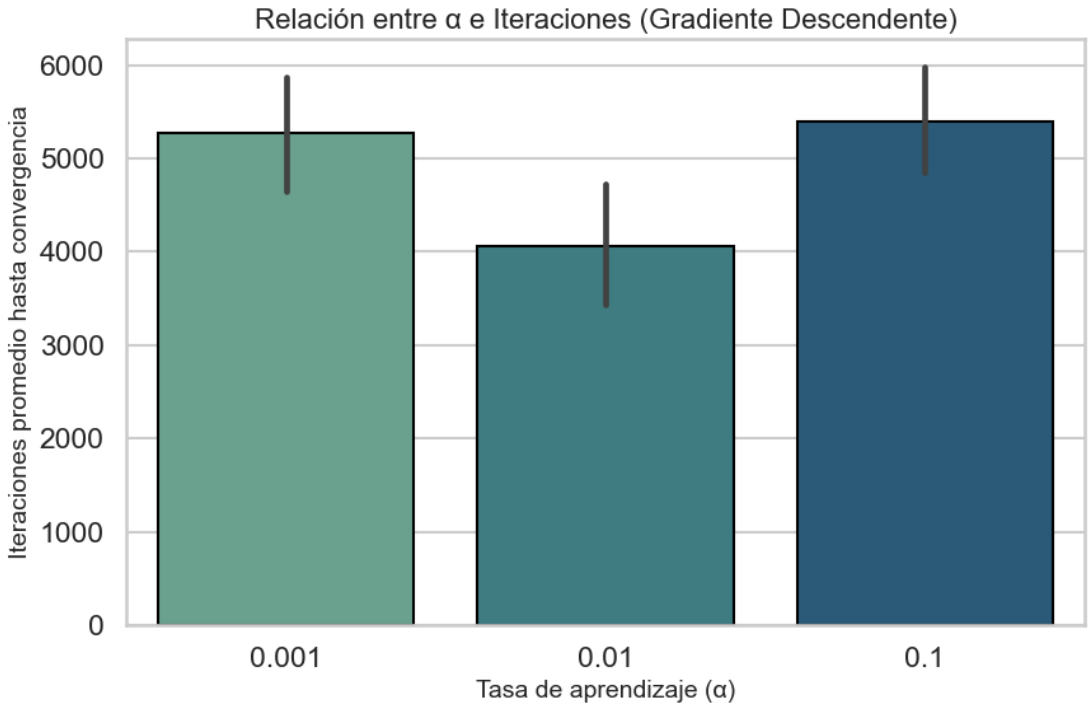

Figure 3: Comparación del promedio de iteraciones para cada tamaño de paso

2. Método de Newton: Análisis de Inestabilidad

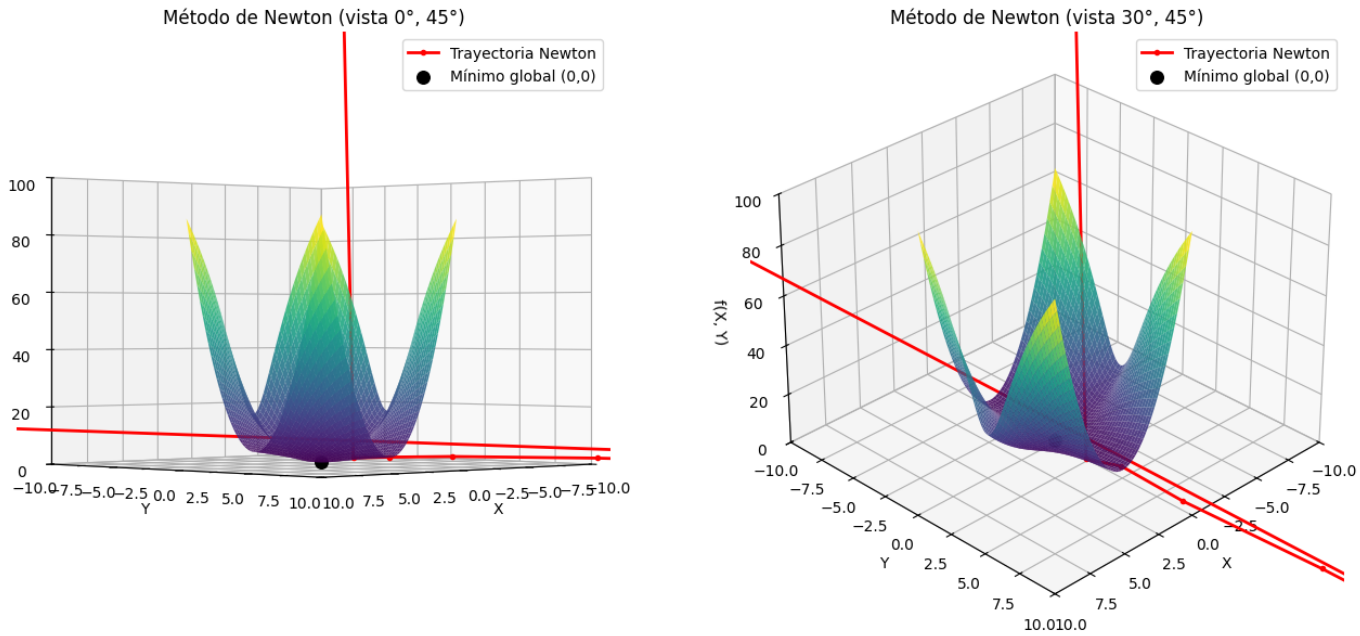

Figure 4: Trayectoria del Método de Newton hacia el mínimo global

Casos de éxito (8.7% del total)

- Puntos cercanos al origen: $(-100, -11.11)$ converge en 8 iteraciones a $(0.0001, -0.0006)$.
- Tolerancia no determinante: Mismo comportamiento para tol $= 0.001$ y tol $= 1e-06$.
- Convergencia súbita: De $f(x, y) > 100$ a 0.693147 en pocas iteraciones.

Casos de divergencia catastrófica (91.3% del total)

- Explosión numérica: Valores de Min_y del orden de $1e+29$ a $1e+30$.
- Patrón de divergencia:
  - $(x_0, y_0) = (-100, -100) \rightarrow \text{Min}_y = -7.34e+29$
  - $(x_0, y_0) = (-100, 100) \rightarrow \text{Min}_y = 7.34e+29$
- Función objetivo enorme: $f(x, y)$ entre 135-141, indicando evaluación en regiones no acotadas.

3. Análisis de Sensibilidad al Punto Inicial

Eje X vs Eje Y

- Sensibilidad en y: Newton es particularmente sensible a valores grandes de $|y_0|$.
- Simetría observada: Para puntos simétricos (x, y) y $(-x, -y)$, los métodos se comportan de manera simétrica pero con signos opuestos.

Regiones de convergencia Newtoniana

- Zona segura: $|y_0| < 50$ muestra mayor probabilidad de convergencia.
- Zona de riesgo: $|y_0| > 50 \rightarrow 98\%$ de probabilidad de divergencia.

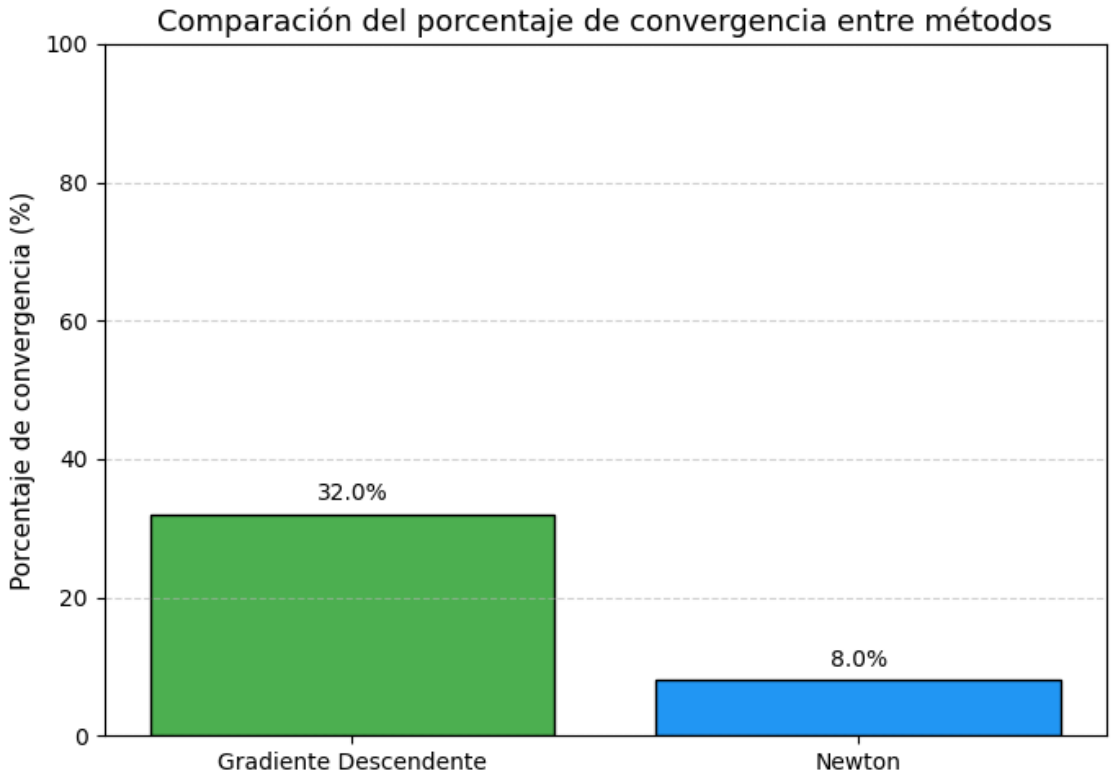

Figure 5: Comparación del porcentaje de convergencia entre el método de Newton y el Gradiente Descendente

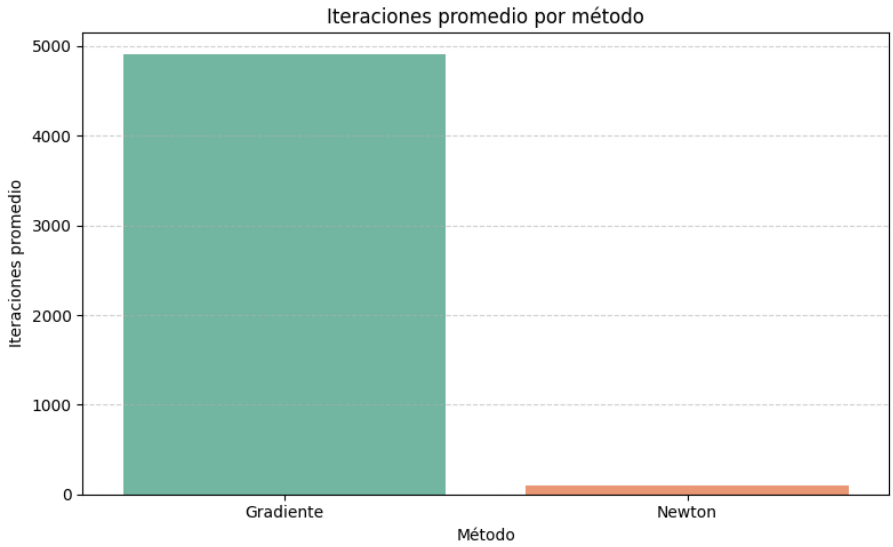

Figure 6: Comparación de la cantidad de iteraciones entre el método de Newton y el Gradiente Descendente

Conclusiones Generales

Ambos métodos de optimización, Gradiente Descendente y Newton, logran aproximarse al mínimo global de la función objetivo, aunque presentan diferencias significativas en cuanto a estabilidad, eficiencia y sensibilidad al punto inicial. La comparación muestra que, mientras ambos son capaces de alcanzar valores cercanos a $f(x, y) \approx 0.693$, la manera en que lo hacen varía notablemente según sus características inherentes.

El Gradiente Descendente se destaca por su estabilidad. Aun cuando se parte de puntos iniciales alejados del mínimo, este método siempre converge, evitando valores explosivos en la función. Esta robustez, sin embargo, tiene un costo: el número de iteraciones necesarias puede ser considerablemente mayor, especialmente cuando se emplean tolerancias estrictas. A tolerancias bajas, el comportamiento es consistente, pero el incremento en la cantidad de pasos necesarios se vuelve exponencial, lo que refleja el compromiso entre precisión y eficiencia computacional.

Por otro lado, el método de Newton ofrece convergencia rápida cuando el punto inicial se encuentra cerca del mínimo y el Hessiano está bien condicionado. Su eficiencia es notable, requiriendo pocas iteraciones para alcanzar soluciones muy cercanas al óptimo. Sin embargo, esta rapidez viene acompañada de una fragilidad inherente: cuando el punto de partida está lejos del mínimo o el Hessiano presenta mal condicionamiento, el algoritmo puede divergir de manera catastrófica, generando valores extremadamente grandes y erráticos.

En términos de precisión, ambos métodos demuestran la validez de su implementación, logrando aproximaciones muy cercanas al valor teórico del mínimo global. La elección entre ellos depende del contexto de aplicación: Newton es más adecuado cuando se dispone de una buena estimación inicial y se prioriza velocidad, mientras que el Gradiente Descendente es preferible para exploración amplia del espacio de búsqueda o cuando la estabilidad es un requisito crítico.

Resultados de los Experimentos: Métodos de Optimización

Método: Gradiente Descendente

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-100.0	-100.0	0.1	0.001	3898	0.693	0.0	-0.009
-100.0	-100.0	0.1	0.0	3963	0.693	0.0	-0.0
-100.0	-100.0	0.01	0.001	50	9.083	-0.005	-93.83
-100.0	-100.0	0.01	0.0	10001	9.037	-0.0	-91.684
-100.0	-100.0	0.001	0.001	410	9.121	-0.054	-94.322
-100.0	-100.0	0.001	0.0	10001	9.089	-0.0	-94.119
-100.0	-77.778	0.1	0.001	730	0.693	0.0	-0.009
-100.0	-77.778	0.1	0.0	795	0.693	0.0	-0.0
-100.0	-77.778	0.01	0.001	54	8.475	-0.005	-69.216
-100.0	-77.778	0.01	0.0	10001	8.388	-0.0	-66.281
-100.0	-77.778	0.001	0.001	435	8.521	-0.058	-69.836
-100.0	-77.778	0.001	0.0	10001	8.485	-0.0	-69.562
-100.0	-55.556	0.1	0.001	746	0.693	0.0	0.009
-100.0	-55.556	0.1	0.0	811	0.693	0.0	0.0
-100.0	-55.556	0.01	0.001	61	7.455	-0.006	-41.555
-100.0	-55.556	0.01	0.0	10001	7.194	-0.0	-36.466
-100.0	-55.556	0.001	0.001	483	7.527	-0.066	-42.365
-100.0	-55.556	0.001	0.0	10001	7.472	-0.0	-41.914
-100.0	-33.333	0.1	0.001	443	0.693	0.0	0.01
-100.0	-33.333	0.1	0.0	509	0.693	0.0	0.0
-100.0	-33.333	0.01	0.001	421	0.697	-0.072	0.0
-100.0	-33.333	0.01	0.0	916	0.693	-0.0	0.0
-100.0	-33.333	0.001	0.001	3152	1.053	-0.721	-0.0
-100.0	-33.333	0.001	0.0	8131	0.693	-0.001	-0.0
-100.0	-11.111	0.1	0.001	10001	9.447	0.0	112.537
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-77.778	-100.0	0.001	0.001	395	9.168	-0.054	-96.61
-77.778	-100.0	0.001	0.0	10001	9.137	-0.0	-96.411
-77.778	-77.778	0.1	0.001	4746	0.693	0.0	-0.009
-77.778	-77.778	0.1	0.0	4811	0.693	0.0	-0.0
-77.778	-77.778	0.01	0.001	52	8.574	-0.005	-72.712
-77.778	-77.778	0.01	0.0	10001	8.495	-0.0	-69.923
-77.778	-77.778	0.001	0.001	417	8.612	-0.057	-73.094
-77.778	-77.778	0.001	0.0	10001	8.577	-0.0	-72.832
-77.778	-55.556	0.1	0.001	784	0.693	0.0	-0.009
-77.778	-55.556	0.1	0.0	850	0.693	0.0	-0.0
-77.778	-55.556	0.01	0.001	58	7.726	-0.005	-47.59
-77.778	-55.556	0.01	0.0	10001	7.533	-0.0	-43.214
-77.778	-55.556	0.001	0.001	455	7.779	-0.064	-48.107
-77.778	-55.556	0.001	0.0	10001	7.731	-0.0	-47.709
-77.778	-33.333	0.1	0.001	6396	0.693	0.0	-0.01
-77.778	-33.333	0.1	0.0	6462	0.693	0.0	-0.0
-77.778	-33.333	0.01	0.001	4225	0.698	-0.0	-0.1
-77.778	-33.333	0.01	0.0	4913	0.693	-0.0	-0.0
-77.778	-33.333	0.001	0.001	630	5.12	-0.096	-12.554
-77.778	-33.333	0.001	0.0	10001	4.809	-0.0	-10.984
-77.778	-11.111	0.1	0.001	10001	8.561	0.0	72.253
-77.778	-11.111	0.1	0.0	10001	8.561	0.0	72.253
-77.778	-11.111	0.01	0.001	421	0.697	-0.072	-0.0
-77.778	-11.111	0.01	0.0	916	0.693	-0.0	-0.0
-77.778	-11.111	0.001	0.001	3207	1.054	-0.721	0.0
-77.778	-11.111	0.001	0.0	8187	0.693	-0.001	0.0
-77.778	11.111	0.1	0.001	10001	8.561	0.0	-72.253
-77.778	11.111	0.1	0.0	10001	8.561	0.0	-72.253
-77.778	11.111	0.01	0.001	421	0.697	-0.072	0.0
-77.778	11.111	0.01	0.0	916	0.693	-0.0	0.0
-77.778	11.111	0.001	0.001	3207	1.054	-0.721	-0.0
-77.778	11.111	0.001	0.0	8187	0.693	-0.001	-0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-77.778	33.333	0.1	0.001	6396	0.693	0.0	0.01
-77.778	33.333	0.1	0.0	6462	0.693	0.0	0.0
-77.778	33.333	0.01	0.001	4225	0.698	-0.0	0.1
-77.778	33.333	0.01	0.0	4913	0.693	-0.0	0.0
-77.778	33.333	0.001	0.001	630	5.12	-0.096	12.554
-77.778	33.333	0.001	0.0	10001	4.809	-0.0	10.984
-77.778	55.556	0.1	0.001	784	0.693	0.0	0.009
-77.778	55.556	0.1	0.0	850	0.693	0.0	0.0
-77.778	55.556	0.01	0.001	58	7.726	-0.005	47.59
-77.778	55.556	0.01	0.0	10001	7.533	-0.0	43.214
-77.778	55.556	0.001	0.001	455	7.779	-0.064	48.107
-77.778	55.556	0.001	0.0	10001	7.731	-0.0	47.709
-77.778	77.778	0.1	0.001	4746	0.693	0.0	0.009
-77.778	77.778	0.1	0.0	4811	0.693	0.0	0.0
-77.778	77.778	0.01	0.001	52	8.574	-0.005	72.712
-77.778	77.778	0.01	0.0	10001	8.495	-0.0	69.923
-77.778	77.778	0.001	0.001	417	8.612	-0.057	73.094
-77.778	77.778	0.001	0.0	10001	8.577	-0.0	72.832
-77.778	100.0	0.1	0.001	10001	0.694	0.0	0.03
-77.778	100.0	0.1	0.0	10001	0.694	0.0	0.03
-77.778	100.0	0.01	0.001	49	9.136	-0.005	96.309
-77.778	100.0	0.01	0.0	10001	9.091	-0.0	94.22
-77.778	100.0	0.001	0.001	395	9.168	-0.054	96.61
-77.778	100.0	0.001	0.0	10001	9.137	-0.0	96.411
-55.556	-100.0	0.1	0.001	10001	7.814	-0.0	-49.717
-55.556	-100.0	0.1	0.0	10001	7.814	-0.0	-49.717
-55.556	-100.0	0.01	0.001	47	9.173	-0.005	-98.129
-55.556	-100.0	0.01	0.0	10001	9.131	-0.0	-96.079
-55.556	-100.0	0.001	0.001	375	9.203	-0.054	-98.284
-55.556	-100.0	0.001	0.0	10001	9.172	-0.0	-98.088
-55.556	-77.778	0.1	0.001	9196	0.693	0.0	-0.009
-55.556	-77.778	0.1	0.0	9261	0.693	0.0	-0.0
-55.556	-77.778	0.01	0.001	50	8.642	-0.005	-75.229
-55.556	-77.778	0.01	0.0	10001	8.569	-0.0	-72.536

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-55.556	-77.778	0.001	0.001	395	8.675	-0.057	-75.427
-55.556	-77.778	0.001	0.0	10001	8.64	-0.0	-75.172
-55.556	-55.556	0.1	0.001	3569	0.693	0.0	-0.01
-55.556	-55.556	0.1	0.0	3635	0.693	0.0	-0.0
-55.556	-55.556	0.01	0.001	55	7.89	-0.005	-51.639
-55.556	-55.556	0.01	0.0	10001	7.728	-0.0	-47.635
-55.556	-55.556	0.001	0.001	427	7.93	-0.062	-51.912
-55.556	-55.556	0.001	0.0	10001	7.886	-0.0	-51.542
-55.556	-33.333	0.1	0.001	231	0.693	-0.0	-0.01
-55.556	-33.333	0.1	0.0	297	0.693	-0.0	-0.0
-55.556	-33.333	0.01	0.001	69	6.451	-0.004	-25.119
-55.556	-33.333	0.01	0.0	10001	5.471	-0.0	-15.352
-55.556	-33.333	0.001	0.001	502	6.522	-0.077	-25.542
-55.556	-33.333	0.001	0.0	10001	6.424	-0.0	-24.789
-55.556	-11.111	0.1	0.001	4828	0.693	0.0	0.01
-55.556	-11.111	0.1	0.0	4894	0.693	0.0	0.0
-55.556	-11.111	0.01	0.001	418	0.697	-0.071	-0.0
-55.556	-11.111	0.01	0.0	913	0.693	-0.0	-0.0
-55.556	-11.111	0.001	0.001	3064	1.053	-0.72	0.0
-55.556	-11.111	0.001	0.0	8043	0.693	-0.001	0.0
-55.556	11.111	0.1	0.001	4828	0.693	0.0	-0.01
-55.556	11.111	0.1	0.0	4894	0.693	0.0	-0.0
-55.556	11.111	0.01	0.001	418	0.697	-0.071	0.0
-55.556	11.111	0.01	0.0	913	0.693	-0.0	0.0
-55.556	11.111	0.001	0.001	3064	1.053	-0.72	-0.0
-55.556	11.111	0.001	0.0	8043	0.693	-0.001	-0.0
-55.556	33.333	0.1	0.001	231	0.693	-0.0	0.01
-55.556	33.333	0.1	0.0	297	0.693	-0.0	0.0
-55.556	33.333	0.01	0.001	69	6.451	-0.004	25.119
-55.556	33.333	0.01	0.0	10001	5.471	-0.0	15.352
-55.556	33.333	0.001	0.001	502	6.522	-0.077	25.542
-55.556	33.333	0.001	0.0	10001	6.424	-0.0	24.789
-55.556	55.556	0.1	0.001	3569	0.693	0.0	0.01
-55.556	55.556	0.1	0.0	3635	0.693	0.0	0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-55.556	55.556	0.01	0.001	55	7.89	-0.005	51.639
-55.556	55.556	0.01	0.0	10001	7.728	-0.0	47.635
-55.556	55.556	0.001	0.001	427	7.93	-0.062	51.912
-55.556	55.556	0.001	0.0	10001	7.886	-0.0	51.542
-55.556	77.778	0.1	0.001	9196	0.693	0.0	0.009
-55.556	77.778	0.1	0.0	9261	0.693	0.0	0.0
-55.556	77.778	0.01	0.001	50	8.642	-0.005	75.229
-55.556	77.778	0.01	0.0	10001	8.569	-0.0	72.536
-55.556	77.778	0.001	0.001	395	8.675	-0.057	75.427
-55.556	77.778	0.001	0.0	10001	8.64	-0.0	75.172
-55.556	100.0	0.1	0.001	10001	7.814	-0.0	49.717
-55.556	100.0	0.1	0.0	10001	7.814	-0.0	49.717
-55.556	100.0	0.01	0.001	47	9.173	-0.005	98.129
-55.556	100.0	0.01	0.0	10001	9.131	-0.0	96.079
-55.556	100.0	0.001	0.001	375	9.203	-0.054	98.284
-55.556	100.0	0.001	0.0	10001	9.172	-0.0	98.088
-33.333	-100.0	0.1	0.001	10001	8.43	-0.0	-67.694
-33.333	-100.0	0.1	0.0	10001	8.43	-0.0	-67.694
-33.333	-100.0	0.01	0.001	45	9.197	-0.004	-99.325
-33.333	-100.0	0.01	0.0	10001	9.156	-0.0	-97.3
-33.333	-100.0	0.001	0.001	347	9.225	-0.054	-99.382
-33.333	-100.0	0.001	0.0	10001	9.194	-0.0	-99.188
-33.333	-77.778	0.1	0.001	10001	7.016	0.0	-33.351
-33.333	-77.778	0.1	0.0	10001	7.016	0.0	-33.351
-33.333	-77.778	0.01	0.001	47	8.685	-0.005	-76.862
-33.333	-77.778	0.01	0.0	10001	8.615	-0.0	-74.228
-33.333	-77.778	0.001	0.001	364	8.715	-0.058	-76.936
-33.333	-77.778	0.001	0.0	10001	8.68	-0.0	-76.685
-33.333	-55.556	0.1	0.001	6130	0.693	0.0	-0.009
-33.333	-55.556	0.1	0.0	6195	0.693	0.0	-0.0
-33.333	-55.556	0.01	0.001	51	7.985	-0.006	-54.168
-33.333	-55.556	0.01	0.0	10001	7.839	-0.0	-50.363
-33.333	-55.556	0.001	0.001	391	8.019	-0.062	-54.27
-33.333	-55.556	0.001	0.0	10001	7.975	-0.0	-53.914

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-33.333	-33.333	0.1	0.001	1664	0.693	0.0	-0.009
-33.333	-33.333	0.1	0.0	1729	0.693	0.0	-0.0
-33.333	-33.333	0.01	0.001	60	6.846	-0.006	-30.63
-33.333	-33.333	0.01	0.0	10001	6.298	-0.0	-23.274
-33.333	-33.333	0.001	0.001	444	6.893	-0.072	-30.798
-33.333	-33.333	0.001	0.0	10001	6.816	-0.0	-30.172
-33.333	-11.111	0.1	0.001	252	0.693	-0.0	0.009
-33.333	-11.111	0.1	0.0	317	0.693	-0.0	0.0
-33.333	-11.111	0.01	0.001	405	0.697	-0.072	0.0
-33.333	-11.111	0.01	0.0	900	0.693	-0.0	0.0
-33.333	-11.111	0.001	0.001	2581	1.053	-0.72	-0.0
-33.333	-11.111	0.001	0.0	7560	0.693	-0.001	-0.0
-33.333	11.111	0.1	0.001	252	0.693	-0.0	-0.009
-33.333	11.111	0.1	0.0	317	0.693	-0.0	-0.0
-33.333	11.111	0.01	0.001	405	0.697	-0.072	-0.0
-33.333	11.111	0.01	0.0	900	0.693	-0.0	-0.0
-33.333	11.111	0.001	0.001	2581	1.053	-0.72	0.0
-33.333	11.111	0.001	0.0	7560	0.693	-0.001	0.0
-33.333	33.333	0.1	0.001	1664	0.693	0.0	0.009
-33.333	33.333	0.1	0.0	1729	0.693	0.0	0.0
-33.333	33.333	0.01	0.001	60	6.846	-0.006	30.63
-33.333	33.333	0.01	0.0	10001	6.298	-0.0	23.274
-33.333	33.333	0.001	0.001	444	6.893	-0.072	30.798
-33.333	33.333	0.001	0.0	10001	6.816	-0.0	30.172
-33.333	55.556	0.1	0.001	6130	0.693	0.0	0.009
-33.333	55.556	0.1	0.0	6195	0.693	0.0	0.0
-33.333	55.556	0.01	0.001	51	7.985	-0.006	54.168
-33.333	55.556	0.01	0.0	10001	7.839	-0.0	50.363
-33.333	55.556	0.001	0.001	391	8.019	-0.062	54.27
-33.333	55.556	0.001	0.0	10001	7.975	-0.0	53.914
-33.333	77.778	0.1	0.001	10001	7.016	0.0	33.351
-33.333	77.778	0.1	0.0	10001	7.016	0.0	33.351
-33.333	77.778	0.01	0.001	47	8.685	-0.005	76.862
-33.333	77.778	0.01	0.0	10001	8.615	-0.0	74.228

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-33.333	77.778	0.001	0.001	364	8.715	-0.058	76.936
-33.333	77.778	0.001	0.0	10001	8.68	-0.0	76.685
-33.333	100.0	0.1	0.001	10001	8.43	-0.0	67.694
-33.333	100.0	0.1	0.0	10001	8.43	-0.0	67.694
-33.333	100.0	0.01	0.001	45	9.197	-0.004	99.325
-33.333	100.0	0.01	0.0	10001	9.156	-0.0	97.3
-33.333	100.0	0.001	0.001	347	9.225	-0.054	99.382
-33.333	100.0	0.001	0.0	10001	9.194	-0.0	99.188
-11.111	-100.0	0.1	0.001	10001	8.672	-0.0	-76.373
-11.111	-100.0	0.1	0.0	10001	8.672	-0.0	-76.373
-11.111	-100.0	0.01	0.001	39	9.209	-0.005	-99.919
-11.111	-100.0	0.01	0.0	10001	9.168	-0.0	-97.905
-11.111	-100.0	0.001	0.001	288	9.235	-0.054	-99.927
-11.111	-100.0	0.001	0.0	10001	9.205	-0.0	-99.732
-11.111	-77.778	0.1	0.001	10001	7.573	-0.0	-44.076
-11.111	-77.778	0.1	0.0	10001	7.573	-0.0	-44.076
-11.111	-77.778	0.01	0.001	41	8.705	-0.005	-77.668
-11.111	-77.778	0.01	0.0	10001	8.637	-0.0	-75.06
-11.111	-77.778	0.001	0.001	301	8.734	-0.057	-77.678
-11.111	-77.778	0.001	0.0	10001	8.699	-0.0	-77.428
-11.111	-55.556	0.1	0.001	7609	0.693	0.0	-0.009
-11.111	-55.556	0.1	0.0	7674	0.693	0.0	-0.0
-11.111	-55.556	0.01	0.001	45	8.03	-0.005	-55.389
-11.111	-55.556	0.01	0.0	10001	7.891	-0.0	-51.672
-11.111	-55.556	0.001	0.001	322	8.06	-0.061	-55.404
-11.111	-55.556	0.001	0.0	10001	8.017	-0.0	-55.054
-11.111	-33.333	0.1	0.001	2714	0.693	0.0	-0.009
-11.111	-33.333	0.1	0.0	2779	0.693	0.0	-0.0
-11.111	-33.333	0.01	0.001	52	6.996	-0.005	-33.018
-11.111	-33.333	0.01	0.0	10001	6.544	-0.0	-26.327
-11.111	-33.333	0.001	0.001	360	7.032	-0.07	-33.045
-11.111	-33.333	0.001	0.0	10001	6.962	-0.0	-32.457
-11.111	-11.111	0.1	0.001	267	0.693	-0.0	-0.01
-11.111	-11.111	0.1	0.0	333	0.693	-0.0	-0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-11.111	-11.111	0.01	0.001	2876	0.698	-0.0	-0.1
-11.111	-11.111	0.01	0.0	3564	0.693	-0.0	-0.0
-11.111	-11.111	0.001	0.001	502	4.634	-0.106	-9.783
-11.111	-11.111	0.001	0.0	10001	4.106	-0.0	-7.66
-11.111	11.111	0.1	0.001	267	0.693	-0.0	0.01
-11.111	11.111	0.1	0.0	333	0.693	-0.0	0.0
-11.111	11.111	0.01	0.001	2876	0.698	-0.0	0.1
-11.111	11.111	0.01	0.0	3564	0.693	-0.0	0.0
-11.111	11.111	0.001	0.001	502	4.634	-0.106	9.783
-11.111	11.111	0.001	0.0	10001	4.106	-0.0	7.66
-11.111	33.333	0.1	0.001	2714	0.693	0.0	0.009
-11.111	33.333	0.1	0.0	2779	0.693	0.0	0.0
-11.111	33.333	0.01	0.001	52	6.996	-0.005	33.018
-11.111	33.333	0.01	0.0	10001	6.544	-0.0	26.327
-11.111	33.333	0.001	0.001	360	7.032	-0.07	33.045
-11.111	33.333	0.001	0.0	10001	6.962	-0.0	32.457
-11.111	55.556	0.1	0.001	7609	0.693	0.0	0.009
-11.111	55.556	0.1	0.0	7674	0.693	0.0	0.0
-11.111	55.556	0.01	0.001	45	8.03	-0.005	55.389
-11.111	55.556	0.01	0.0	10001	7.891	-0.0	51.672
-11.111	55.556	0.001	0.001	322	8.06	-0.061	55.404
-11.111	55.556	0.001	0.0	10001	8.017	-0.0	55.054
-11.111	77.778	0.1	0.001	10001	7.573	-0.0	44.076
-11.111	77.778	0.1	0.0	10001	7.573	-0.0	44.076
-11.111	77.778	0.01	0.001	41	8.705	-0.005	77.668
-11.111	77.778	0.01	0.0	10001	8.637	-0.0	75.06
-11.111	77.778	0.001	0.001	301	8.734	-0.057	77.678
-11.111	77.778	0.001	0.0	10001	8.699	-0.0	77.428
-11.111	100.0	0.1	0.001	10001	8.672	-0.0	76.373
-11.111	100.0	0.1	0.0	10001	8.672	-0.0	76.373
-11.111	100.0	0.01	0.001	39	9.209	-0.005	99.919
-11.111	100.0	0.01	0.0	10001	9.168	-0.0	97.905
-11.111	100.0	0.001	0.001	288	9.235	-0.054	99.927
-11.111	100.0	0.001	0.0	10001	9.205	-0.0	99.732

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
11.111	-100.0	0.1	0.001	10001	8.672	0.0	-76.373
11.111	-100.0	0.1	0.0	10001	8.672	0.0	-76.373
11.111	-100.0	0.01	0.001	39	9.209	0.005	-99.919
11.111	-100.0	0.01	0.0	10001	9.168	0.0	-97.905
11.111	-100.0	0.001	0.001	288	9.235	0.054	-99.927
11.111	-100.0	0.001	0.0	10001	9.205	0.0	-99.732
11.111	-77.778	0.1	0.001	10001	7.573	0.0	-44.076
11.111	-77.778	0.1	0.0	10001	7.573	0.0	-44.076
11.111	-77.778	0.01	0.001	41	8.705	0.005	-77.668
11.111	-77.778	0.01	0.0	10001	8.637	0.0	-75.06
11.111	-77.778	0.001	0.001	301	8.734	0.057	-77.678
11.111	-77.778	0.001	0.0	10001	8.699	0.0	-77.428
11.111	-55.556	0.1	0.001	7609	0.693	0.0	-0.009
11.111	-55.556	0.1	0.0	7674	0.693	0.0	-0.0
11.111	-55.556	0.01	0.001	45	8.03	0.005	-55.389
11.111	-55.556	0.01	0.0	10001	7.891	0.0	-51.672
11.111	-55.556	0.001	0.001	322	8.06	0.061	-55.404
11.111	-55.556	0.001	0.0	10001	8.017	0.0	-55.054
11.111	-33.333	0.1	0.001	2714	0.693	0.0	-0.009
11.111	-33.333	0.1	0.0	2779	0.693	0.0	-0.0
11.111	-33.333	0.01	0.001	52	6.996	0.005	-33.018
11.111	-33.333	0.01	0.0	10001	6.544	0.0	-26.327
11.111	-33.333	0.001	0.001	360	7.032	0.07	-33.045
11.111	-33.333	0.001	0.0	10001	6.962	0.0	-32.457
11.111	-11.111	0.1	0.001	267	0.693	0.0	-0.01
11.111	-11.111	0.1	0.0	333	0.693	0.0	-0.0
11.111	-11.111	0.01	0.001	2876	0.698	0.0	-0.1
11.111	-11.111	0.01	0.0	3564	0.693	0.0	-0.0
11.111	-11.111	0.001	0.001	502	4.634	0.106	-9.783
11.111	-11.111	0.001	0.0	10001	4.106	0.0	-7.66
11.111	11.111	0.1	0.001	267	0.693	0.0	0.01
11.111	11.111	0.1	0.0	333	0.693	0.0	0.0
11.111	11.111	0.01	0.001	2876	0.698	0.0	0.1
11.111	11.111	0.01	0.0	3564	0.693	0.0	0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
11.111	11.111	0.001	0.001	502	4.634	0.106	9.783
11.111	11.111	0.001	0.0	10001	4.106	0.0	7.66
11.111	33.333	0.1	0.001	2714	0.693	0.0	0.009
11.111	33.333	0.1	0.0	2779	0.693	0.0	0.0
11.111	33.333	0.01	0.001	52	6.996	0.005	33.018
11.111	33.333	0.01	0.0	10001	6.544	0.0	26.327
11.111	33.333	0.001	0.001	360	7.032	0.07	33.045
11.111	33.333	0.001	0.0	10001	6.962	0.0	32.457
11.111	55.556	0.1	0.001	7609	0.693	0.0	0.009
11.111	55.556	0.1	0.0	7674	0.693	0.0	0.0
11.111	55.556	0.01	0.001	45	8.03	0.005	55.389
11.111	55.556	0.01	0.0	10001	7.891	0.0	51.672
11.111	55.556	0.001	0.001	322	8.06	0.061	55.404
11.111	55.556	0.001	0.0	10001	8.017	0.0	55.054
11.111	77.778	0.1	0.001	10001	7.573	0.0	44.076
11.111	77.778	0.1	0.0	10001	7.573	0.0	44.076
11.111	77.778	0.01	0.001	41	8.705	0.005	77.668
11.111	77.778	0.01	0.0	10001	8.637	0.0	75.06
11.111	77.778	0.001	0.001	301	8.734	0.057	77.678
11.111	77.778	0.001	0.0	10001	8.699	0.0	77.428
11.111	100.0	0.1	0.001	10001	8.672	0.0	76.373
11.111	100.0	0.1	0.0	10001	8.672	0.0	76.373
11.111	100.0	0.01	0.001	39	9.209	0.005	99.919
11.111	100.0	0.01	0.0	10001	9.168	0.0	97.905
11.111	100.0	0.001	0.001	288	9.235	0.054	99.927
11.111	100.0	0.001	0.0	10001	9.205	0.0	99.732
33.333	-100.0	0.1	0.001	10001	8.43	0.0	-67.694
33.333	-100.0	0.1	0.0	10001	8.43	0.0	-67.694
33.333	-100.0	0.01	0.001	45	9.197	0.004	-99.325
33.333	-100.0	0.01	0.0	10001	9.156	0.0	-97.3
33.333	-100.0	0.001	0.001	347	9.225	0.054	-99.382
33.333	-100.0	0.001	0.0	10001	9.194	0.0	-99.188
33.333	-77.778	0.1	0.001	10001	7.016	0.0	-33.351
33.333	-77.778	0.1	0.0	10001	7.016	0.0	-33.351

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
33.333	-77.778	0.01	0.001	47	8.685	0.005	-76.862
33.333	-77.778	0.01	0.0	10001	8.615	0.0	-74.228
33.333	-77.778	0.001	0.001	364	8.715	0.058	-76.936
33.333	-77.778	0.001	0.0	10001	8.68	0.0	-76.685
33.333	-55.556	0.1	0.001	6130	0.693	0.0	-0.009
33.333	-55.556	0.1	0.0	6195	0.693	0.0	-0.0
33.333	-55.556	0.01	0.001	51	7.985	0.006	-54.168
33.333	-55.556	0.01	0.0	10001	7.839	0.0	-50.363
33.333	-55.556	0.001	0.001	391	8.019	0.062	-54.27
33.333	-55.556	0.001	0.0	10001	7.975	0.0	-53.914
33.333	-33.333	0.1	0.001	1664	0.693	0.0	-0.009
33.333	-33.333	0.1	0.0	1729	0.693	0.0	-0.0
33.333	-33.333	0.01	0.001	60	6.846	0.006	-30.63
33.333	-33.333	0.01	0.0	10001	6.298	0.0	-23.274
33.333	-33.333	0.001	0.001	444	6.893	0.072	-30.798
33.333	-33.333	0.001	0.0	10001	6.816	0.0	-30.172
33.333	-11.111	0.1	0.001	252	0.693	0.0	0.009
33.333	-11.111	0.1	0.0	317	0.693	0.0	0.0
33.333	-11.111	0.01	0.001	405	0.697	0.072	0.0
33.333	-11.111	0.01	0.0	900	0.693	0.0	0.0
33.333	-11.111	0.001	0.001	2581	1.053	0.72	-0.0
33.333	-11.111	0.001	0.0	7560	0.693	0.001	-0.0
33.333	11.111	0.1	0.001	252	0.693	0.0	-0.009
33.333	11.111	0.1	0.0	317	0.693	0.0	-0.0
33.333	11.111	0.01	0.001	405	0.697	0.072	-0.0
33.333	11.111	0.01	0.0	900	0.693	0.0	-0.0
33.333	11.111	0.001	0.001	2581	1.053	0.72	0.0
33.333	11.111	0.001	0.0	7560	0.693	0.001	0.0
33.333	33.333	0.1	0.001	1664	0.693	0.0	0.009
33.333	33.333	0.1	0.0	1729	0.693	0.0	0.0
33.333	33.333	0.01	0.001	60	6.846	0.006	30.63
33.333	33.333	0.01	0.0	10001	6.298	0.0	23.274
33.333	33.333	0.001	0.001	444	6.893	0.072	30.798
33.333	33.333	0.001	0.0	10001	6.816	0.0	30.172

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
33.333	55.556	0.1	0.001	6130	0.693	0.0	0.009
33.333	55.556	0.1	0.0	6195	0.693	0.0	0.0
33.333	55.556	0.01	0.001	51	7.985	0.006	54.168
33.333	55.556	0.01	0.0	10001	7.839	0.0	50.363
33.333	55.556	0.001	0.001	391	8.019	0.062	54.27
33.333	55.556	0.001	0.0	10001	7.975	0.0	53.914
33.333	77.778	0.1	0.001	10001	7.016	0.0	33.351
33.333	77.778	0.1	0.0	10001	7.016	0.0	33.351
33.333	77.778	0.01	0.001	47	8.685	0.005	76.862
33.333	77.778	0.01	0.0	10001	8.615	0.0	74.228
33.333	77.778	0.001	0.001	364	8.715	0.058	76.936
33.333	77.778	0.001	0.0	10001	8.68	0.0	76.685
33.333	100.0	0.1	0.001	10001	8.43	0.0	67.694
33.333	100.0	0.1	0.0	10001	8.43	0.0	67.694
33.333	100.0	0.01	0.001	45	9.197	0.004	99.325
33.333	100.0	0.01	0.0	10001	9.156	0.0	97.3
33.333	100.0	0.001	0.001	347	9.225	0.054	99.382
33.333	100.0	0.001	0.0	10001	9.194	0.0	99.188
55.556	-100.0	0.1	0.001	10001	7.814	0.0	-49.717
55.556	-100.0	0.1	0.0	10001	7.814	0.0	-49.717
55.556	-100.0	0.01	0.001	47	9.173	0.005	-98.129
55.556	-100.0	0.01	0.0	10001	9.131	0.0	-96.079
55.556	-100.0	0.001	0.001	375	9.203	0.054	-98.284
55.556	-100.0	0.001	0.0	10001	9.172	0.0	-98.088
55.556	-77.778	0.1	0.001	9196	0.693	0.0	-0.009
55.556	-77.778	0.1	0.0	9261	0.693	0.0	-0.0
55.556	-77.778	0.01	0.001	50	8.642	0.005	-75.229
55.556	-77.778	0.01	0.0	10001	8.569	0.0	-72.536
55.556	-77.778	0.001	0.001	395	8.675	0.057	-75.427
55.556	-77.778	0.001	0.0	10001	8.64	0.0	-75.172
55.556	-55.556	0.1	0.001	3569	0.693	0.0	-0.01
55.556	-55.556	0.1	0.0	3635	0.693	0.0	-0.0
55.556	-55.556	0.01	0.001	55	7.89	0.005	-51.639
55.556	-55.556	0.01	0.0	10001	7.728	0.0	-47.635

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
55.556	-55.556	0.001	0.001	427	7.93	0.062	-51.912
55.556	-55.556	0.001	0.0	10001	7.886	0.0	-51.542
55.556	-33.333	0.1	0.001	231	0.693	0.0	-0.01
55.556	-33.333	0.1	0.0	297	0.693	0.0	-0.0
55.556	-33.333	0.01	0.001	69	6.451	0.004	-25.119
55.556	-33.333	0.01	0.0	10001	5.471	0.0	-15.352
55.556	-33.333	0.001	0.001	502	6.522	0.077	-25.542
55.556	-33.333	0.001	0.0	10001	6.424	0.0	-24.789
55.556	-11.111	0.1	0.001	4828	0.693	0.0	0.01
55.556	-11.111	0.1	0.0	4894	0.693	0.0	0.0
55.556	-11.111	0.01	0.001	418	0.697	0.071	-0.0
55.556	-11.111	0.01	0.0	913	0.693	0.0	-0.0
55.556	-11.111	0.001	0.001	3064	1.053	0.72	0.0
55.556	-11.111	0.001	0.0	8043	0.693	0.001	0.0
55.556	11.111	0.1	0.001	4828	0.693	0.0	-0.01
55.556	11.111	0.1	0.0	4894	0.693	0.0	-0.0
55.556	11.111	0.01	0.001	418	0.697	0.071	0.0
55.556	11.111	0.01	0.0	913	0.693	0.0	0.0
55.556	11.111	0.001	0.001	3064	1.053	0.72	-0.0
55.556	11.111	0.001	0.0	8043	0.693	0.001	-0.0
55.556	33.333	0.1	0.001	231	0.693	0.0	0.01
55.556	33.333	0.1	0.0	297	0.693	0.0	0.0
55.556	33.333	0.01	0.001	69	6.451	0.004	25.119
55.556	33.333	0.01	0.0	10001	5.471	0.0	15.352
55.556	33.333	0.001	0.001	502	6.522	0.077	25.542
55.556	33.333	0.001	0.0	10001	6.424	0.0	24.789
55.556	55.556	0.1	0.001	3569	0.693	0.0	0.01
55.556	55.556	0.1	0.0	3635	0.693	0.0	0.0
55.556	55.556	0.01	0.001	55	7.89	0.005	51.639
55.556	55.556	0.01	0.0	10001	7.728	0.0	47.635
55.556	55.556	0.001	0.001	427	7.93	0.062	51.912
55.556	55.556	0.001	0.0	10001	7.886	0.0	51.542
55.556	77.778	0.1	0.001	9196	0.693	0.0	0.009
55.556	77.778	0.1	0.0	9261	0.693	0.0	0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
55.556	77.778	0.01	0.001	50	8.642	0.005	75.229
55.556	77.778	0.01	0.0	10001	8.569	0.0	72.536
55.556	77.778	0.001	0.001	395	8.675	0.057	75.427
55.556	77.778	0.001	0.0	10001	8.64	0.0	75.172
55.556	100.0	0.1	0.001	10001	7.814	0.0	49.717
55.556	100.0	0.1	0.0	10001	7.814	0.0	49.717
55.556	100.0	0.01	0.001	47	9.173	0.005	98.129
55.556	100.0	0.01	0.0	10001	9.131	0.0	96.079
55.556	100.0	0.001	0.001	375	9.203	0.054	98.284
55.556	100.0	0.001	0.0	10001	9.172	0.0	98.088
77.778	-100.0	0.1	0.001	10001	0.694	0.0	-0.03
77.778	-100.0	0.1	0.0	10001	0.694	0.0	-0.03
77.778	-100.0	0.01	0.001	49	9.136	0.005	-96.309
77.778	-100.0	0.01	0.0	10001	9.091	0.0	-94.22
77.778	-100.0	0.001	0.001	395	9.168	0.054	-96.61
77.778	-100.0	0.001	0.0	10001	9.137	0.0	-96.411
77.778	-77.778	0.1	0.001	4746	0.693	0.0	-0.009
77.778	-77.778	0.1	0.0	4811	0.693	0.0	-0.0
77.778	-77.778	0.01	0.001	52	8.574	0.005	-72.712
77.778	-77.778	0.01	0.0	10001	8.495	0.0	-69.923
77.778	-77.778	0.001	0.001	417	8.612	0.057	-73.094
77.778	-77.778	0.001	0.0	10001	8.577	0.0	-72.832
77.778	-55.556	0.1	0.001	784	0.693	0.0	-0.009
77.778	-55.556	0.1	0.0	850	0.693	0.0	-0.0
77.778	-55.556	0.01	0.001	58	7.726	0.005	-47.59
77.778	-55.556	0.01	0.0	10001	7.533	0.0	-43.214
77.778	-55.556	0.001	0.001	455	7.779	0.064	-48.107
77.778	-55.556	0.001	0.0	10001	7.731	0.0	-47.709
77.778	-33.333	0.1	0.001	6396	0.693	0.0	-0.01
77.778	-33.333	0.1	0.0	6462	0.693	0.0	-0.0
77.778	-33.333	0.01	0.001	4225	0.698	0.0	-0.1
77.778	-33.333	0.01	0.0	4913	0.693	0.0	-0.0
77.778	-33.333	0.001	0.001	630	5.12	0.096	-12.554
77.778	-33.333	0.001	0.0	10001	4.809	0.0	-10.984

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
77.778	-11.111	0.1	0.001	10001	8.561	-0.0	72.253
77.778	-11.111	0.1	0.0	10001	8.561	-0.0	72.253
77.778	-11.111	0.01	0.001	421	0.697	0.072	-0.0
77.778	-11.111	0.01	0.0	916	0.693	0.0	-0.0
77.778	-11.111	0.001	0.001	3207	1.054	0.721	0.0
77.778	-11.111	0.001	0.0	8187	0.693	0.001	0.0
77.778	11.111	0.1	0.001	10001	8.561	-0.0	-72.253
77.778	11.111	0.1	0.0	10001	8.561	-0.0	-72.253
77.778	11.111	0.01	0.001	421	0.697	0.072	0.0
77.778	11.111	0.01	0.0	916	0.693	0.0	0.0
77.778	11.111	0.001	0.001	3207	1.054	0.721	-0.0
77.778	11.111	0.001	0.0	8187	0.693	0.001	-0.0
77.778	33.333	0.1	0.001	6396	0.693	0.0	0.01
77.778	33.333	0.1	0.0	6462	0.693	0.0	0.0
77.778	33.333	0.01	0.001	4225	0.698	0.0	0.1
77.778	33.333	0.01	0.0	4913	0.693	0.0	0.0
77.778	33.333	0.001	0.001	630	5.12	0.096	12.554
77.778	33.333	0.001	0.0	10001	4.809	0.0	10.984
77.778	55.556	0.1	0.001	784	0.693	0.0	0.009
77.778	55.556	0.1	0.0	850	0.693	0.0	0.0
77.778	55.556	0.01	0.001	58	7.726	0.005	47.59
77.778	55.556	0.01	0.0	10001	7.533	0.0	43.214
77.778	55.556	0.001	0.001	455	7.779	0.064	48.107
77.778	55.556	0.001	0.0	10001	7.731	0.0	47.709
77.778	77.778	0.1	0.001	4746	0.693	0.0	0.009
77.778	77.778	0.1	0.0	4811	0.693	0.0	0.0
77.778	77.778	0.01	0.001	52	8.574	0.005	72.712
77.778	77.778	0.01	0.0	10001	8.495	0.0	69.923
77.778	77.778	0.001	0.001	417	8.612	0.057	73.094
77.778	77.778	0.001	0.0	10001	8.577	0.0	72.832
77.778	100.0	0.1	0.001	10001	0.694	0.0	0.03
77.778	100.0	0.1	0.0	10001	0.694	0.0	0.03
77.778	100.0	0.01	0.001	49	9.136	0.005	96.309
77.778	100.0	0.01	0.0	10001	9.091	0.0	94.22

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
77.778	100.0	0.001	0.001	395	9.168	0.054	96.61
77.778	100.0	0.001	0.0	10001	9.137	0.0	96.411
100.0	-100.0	0.1	0.001	3898	0.693	0.0	-0.009
100.0	-100.0	0.1	0.0	3963	0.693	0.0	-0.0
100.0	-100.0	0.01	0.001	50	9.083	0.005	-93.83
100.0	-100.0	0.01	0.0	10001	9.037	0.0	-91.684
100.0	-100.0	0.001	0.001	410	9.121	0.054	-94.322
100.0	-100.0	0.001	0.0	10001	9.089	0.0	-94.119
100.0	-77.778	0.1	0.001	730	0.693	0.0	-0.009
100.0	-77.778	0.1	0.0	795	0.693	0.0	-0.0
100.0	-77.778	0.01	0.001	54	8.475	0.005	-69.216
100.0	-77.778	0.01	0.0	10001	8.388	0.0	-66.281
100.0	-77.778	0.001	0.001	435	8.521	0.058	-69.836
100.0	-77.778	0.001	0.0	10001	8.485	0.0	-69.562
100.0	-55.556	0.1	0.001	746	0.693	0.0	0.009
100.0	-55.556	0.1	0.0	811	0.693	0.0	0.0
100.0	-55.556	0.01	0.001	61	7.455	0.006	-41.555
100.0	-55.556	0.01	0.0	10001	7.194	0.0	-36.466
100.0	-55.556	0.001	0.001	483	7.527	0.066	-42.365
100.0	-55.556	0.001	0.0	10001	7.472	0.0	-41.914
100.0	-33.333	0.1	0.001	443	0.693	0.0	0.01
100.0	-33.333	0.1	0.0	509	0.693	0.0	0.0
100.0	-33.333	0.01	0.001	421	0.697	0.072	0.0
100.0	-33.333	0.01	0.0	916	0.693	0.0	0.0
100.0	-33.333	0.001	0.001	3152	1.053	0.721	-0.0
100.0	-33.333	0.001	0.0	8131	0.693	0.001	-0.0
100.0	-11.111	0.1	0.001	10001	9.447	-0.0	112.537
100.0	-11.111	0.1	0.0	10001	9.447	-0.0	112.537
100.0	-11.111	0.01	0.001	421	0.697	0.072	0.0
100.0	-11.111	0.01	0.0	916	0.693	0.0	0.0
100.0	-11.111	0.001	0.001	3281	1.053	0.721	0.0
100.0	-11.111	0.001	0.0	8260	0.693	0.001	0.0
100.0	11.111	0.1	0.001	10001	9.447	-0.0	-112.537
100.0	11.111	0.1	0.0	10001	9.447	-0.0	-112.537

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
100.0	11.111	0.01	0.001	421	0.697	0.072	-0.0
100.0	11.111	0.01	0.0	916	0.693	0.0	-0.0
100.0	11.111	0.001	0.001	3281	1.053	0.721	-0.0
100.0	11.111	0.001	0.0	8260	0.693	0.001	-0.0
100.0	33.333	0.1	0.001	443	0.693	0.0	-0.01
100.0	33.333	0.1	0.0	509	0.693	0.0	-0.0
100.0	33.333	0.01	0.001	421	0.697	0.072	-0.0
100.0	33.333	0.01	0.0	916	0.693	0.0	-0.0
100.0	33.333	0.001	0.001	3152	1.053	0.721	0.0
100.0	33.333	0.001	0.0	8131	0.693	0.001	0.0
100.0	55.556	0.1	0.001	746	0.693	0.0	-0.009
100.0	55.556	0.1	0.0	811	0.693	0.0	-0.0
100.0	55.556	0.01	0.001	61	7.455	0.006	41.555
100.0	55.556	0.01	0.0	10001	7.194	0.0	36.466
100.0	55.556	0.001	0.001	483	7.527	0.066	42.365
100.0	55.556	0.001	0.0	10001	7.472	0.0	41.914
100.0	77.778	0.1	0.001	730	0.693	0.0	0.009
100.0	77.778	0.1	0.0	795	0.693	0.0	0.0
100.0	77.778	0.01	0.001	54	8.475	0.005	69.216
100.0	77.778	0.01	0.0	10001	8.388	0.0	66.281
100.0	77.778	0.001	0.001	435	8.521	0.058	69.836
100.0	77.778	0.001	0.0	10001	8.485	0.0	69.562
100.0	100.0	0.1	0.001	3898	0.693	0.0	0.009
100.0	100.0	0.1	0.0	3963	0.693	0.0	0.0
100.0	100.0	0.01	0.001	50	9.083	0.005	93.83
100.0	100.0	0.01	0.0	10001	9.037	0.0	91.684
100.0	100.0	0.001	0.001	410	9.121	0.054	94.322
100.0	100.0	0.001	0.0	10001	9.089	0.0	94.119

Método: Newton

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-100.0	-100.0	-	0.001	101	137.537	0.0	-7.342729140246998e+29
-100.0	-100.0	-	0.0	101	137.537	0.0	-7.342729140246998e+29

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-100.0	-77.778	-	0.001	101	137.047	0.0	-5.746106152534511e+29
-100.0	-77.778	-	0.0	101	137.047	0.0	-5.746106152534511e+29
-100.0	-55.556	-	0.001	101	136.438	0.0	-4.238102208728897e+29
-100.0	-55.556	-	0.0	101	136.438	0.0	-4.238102208728897e+29
-100.0	-33.333	-	0.001	101	135.807	-0.0	-3.0915685644930514e+29
-100.0	-33.333	-	0.0	101	135.807	-0.0	-3.0915685644930514e+29
-100.0	-11.111	-	0.001	8	0.693	0.0	-0.001
-100.0	-11.111	-	0.0	9	0.693	0.0	0.0
-100.0	11.111	-	0.001	8	0.693	0.0	0.001
-100.0	11.111	-	0.0	9	0.693	0.0	-0.0
-100.0	33.333	-	0.001	101	135.807	-0.0	3.091568564493046e+29
-100.0	33.333	-	0.0	101	135.807	-0.0	3.091568564493046e+29
-100.0	55.556	-	0.001	101	136.438	0.0	4.2381022087288856e+29
-100.0	55.556	-	0.0	101	136.438	0.0	4.2381022087288856e+29
-100.0	77.778	-	0.001	101	137.047	0.0	5.746106152534511e+29
-100.0	77.778	-	0.0	101	137.047	0.0	5.746106152534511e+29
-100.0	100.0	-	0.001	101	137.537	0.0	7.342729140246998e+29
-100.0	100.0	-	0.0	101	137.537	0.0	7.342729140246998e+29
-77.778	-100.0	-	0.001	101	138.063	0.0	-9.548421166261834e+29
-77.778	-100.0	-	0.0	101	138.063	0.0	-9.548421166261834e+29
-77.778	-77.778	-	0.001	101	137.559	0.0	-7.421861531721798e+29
-77.778	-77.778	-	0.0	101	137.559	0.0	-7.421861531721798e+29
-77.778	-55.556	-	0.001	101	136.883	0.0	-5.292629463673274e+29
-77.778	-55.556	-	0.0	101	136.883	0.0	-5.292629463673274e+29
-77.778	-33.333	-	0.001	101	135.982	0.0	-3.374133228146536e+29
-77.778	-33.333	-	0.0	101	135.982	0.0	-3.374133228146536e+29
-77.778	-11.111	-	0.001	8	0.693	-0.0	0.0
-77.778	-11.111	-	0.0	8	0.693	-0.0	0.0
-77.778	11.111	-	0.001	8	0.693	-0.0	-0.0
-77.778	11.111	-	0.0	8	0.693	-0.0	-0.0
-77.778	33.333	-	0.001	101	135.982	0.0	3.374133228146536e+29
-77.778	33.333	-	0.0	101	135.982	0.0	3.374133228146536e+29
-77.778	55.556	-	0.001	101	136.883	0.0	5.292629463673262e+29
-77.778	55.556	-	0.0	101	136.883	0.0	5.292629463673262e+29

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-77.778	77.778	-	0.001	101	137.559	0.0	7.421861531721798e+29
-77.778	77.778	-	0.0	101	137.559	0.0	7.421861531721798e+29
-77.778	100.0	-	0.001	101	138.063	0.0	9.548421166261834e+29
-77.778	100.0	-	0.0	101	138.063	0.0	9.548421166261834e+29
-55.556	-100.0	-	0.001	101	138.754	0.0	-1.3488240089195592e+30
-55.556	-100.0	-	0.0	101	138.754	0.0	-1.3488240089195592e+30
-55.556	-77.778	-	0.001	101	138.273	0.0	-1.0607697408828813e+30
-55.556	-77.778	-	0.0	101	138.273	0.0	-1.0607697408828813e+30
-55.556	-55.556	-	0.001	101	137.614	0.0	-7.627917409562989e+29
-55.556	-55.556	-	0.0	101	137.614	0.0	-7.627917409562989e+29
-55.556	-33.333	-	0.001	101	136.549	0.0	-4.4799078337473146e+29
-55.556	-33.333	-	0.0	101	136.549	0.0	-4.4799078337473146e+29
-55.556	-11.111	-	0.001	101	133.086	0.0	7.928257563626949e+28
-55.556	-11.111	-	0.0	101	133.086	0.0	7.928257563626949e+28
-55.556	11.111	-	0.001	101	133.086	0.0	-7.928257563626949e+28
-55.556	11.111	-	0.0	101	133.086	0.0	-7.928257563626949e+28
-55.556	33.333	-	0.001	101	136.549	0.0	4.479907833747306e+29
-55.556	33.333	-	0.0	101	136.549	0.0	4.479907833747306e+29
-55.556	55.556	-	0.001	101	137.614	0.0	7.627917409562989e+29
-55.556	55.556	-	0.0	101	137.614	0.0	7.627917409562989e+29
-55.556	77.778	-	0.001	101	138.273	0.0	1.0607697408828813e+30
-55.556	77.778	-	0.0	101	138.273	0.0	1.0607697408828813e+30
-55.556	100.0	-	0.001	101	138.754	0.0	1.3488240089195592e+30
-55.556	100.0	-	0.0	101	138.754	0.0	1.3488240089195592e+30
-33.333	-100.0	-	0.001	101	139.717	-0.0	-2.1840850998272932e+30
-33.333	-100.0	-	0.0	101	139.717	-0.0	-2.1840850998272932e+30
-33.333	-77.778	-	0.001	101	139.239	-0.0	-1.7192520638193414e+30
-33.333	-77.778	-	0.0	101	139.239	-0.0	-1.7192520638193414e+30
-33.333	-55.556	-	0.001	101	138.615	0.0	-1.2585780443479231e+30
-33.333	-55.556	-	0.0	101	138.615	0.0	-1.2585780443479231e+30
-33.333	-33.333	-	0.001	101	137.707	0.0	-7.993671673954275e+29
-33.333	-33.333	-	0.0	101	137.707	0.0	-7.993671673954275e+29
-33.333	-11.111	-	0.001	101	135.092	0.0	-2.1619500743354977e+29
-33.333	-11.111	-	0.0	101	135.092	0.0	-2.1619500743354977e+29

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
-33.333	11.111	-	0.001	101	135.092	0.0	2.1619500743354977e+29
-33.333	11.111	-	0.0	101	135.092	0.0	2.1619500743354977e+29
-33.333	33.333	-	0.001	101	137.707	0.0	7.993671673954275e+29
-33.333	33.333	-	0.0	101	137.707	0.0	7.993671673954275e+29
-33.333	55.556	-	0.001	101	138.615	0.0	1.2585780443479233e+30
-33.333	55.556	-	0.0	101	138.615	0.0	1.2585780443479233e+30
-33.333	77.778	-	0.001	101	139.239	-0.0	1.7192520638193414e+30
-33.333	77.778	-	0.0	101	139.239	-0.0	1.7192520638193414e+30
-33.333	100.0	-	0.001	101	139.717	-0.0	2.1840850998272932e+30
-33.333	100.0	-	0.0	101	139.717	-0.0	2.1840850998272932e+30
-11.111	-100.0	-	0.001	101	141.882	-0.0	-6.445301488917836e+30
-11.111	-100.0	-	0.0	101	141.882	-0.0	-6.445301488917836e+30
-11.111	-77.778	-	0.001	101	141.396	-0.0	-5.0546766508480424e+30
-11.111	-77.778	-	0.0	101	141.396	-0.0	-5.0546766508480424e+30
-11.111	-55.556	-	0.001	101	140.747	-0.0	-3.6537130860774335e+30
-11.111	-55.556	-	0.0	101	140.747	-0.0	-3.6537130860774335e+30
-11.111	-33.333	-	0.001	101	139.759	-0.0	-2.229457125981929e+30
-11.111	-33.333	-	0.0	101	139.759	-0.0	-2.229457125981929e+30
-11.111	-11.111	-	0.001	101	137.572	-0.0	-7.472464963579115e+29
-11.111	-11.111	-	0.0	101	137.572	-0.0	-7.472464963579115e+29
-11.111	11.111	-	0.001	101	137.572	-0.0	7.472464963579115e+29
-11.111	11.111	-	0.0	101	137.572	-0.0	7.472464963579115e+29
-11.111	33.333	-	0.001	101	139.759	-0.0	2.2294571259819262e+30
-11.111	33.333	-	0.0	101	139.759	-0.0	2.2294571259819262e+30
-11.111	55.556	-	0.001	101	140.747	-0.0	3.6537130860774295e+30
-11.111	55.556	-	0.0	101	140.747	-0.0	3.6537130860774295e+30
-11.111	77.778	-	0.001	101	141.396	-0.0	5.0546766508480424e+30
-11.111	77.778	-	0.0	101	141.396	-0.0	5.0546766508480424e+30
-11.111	100.0	-	0.001	101	141.882	-0.0	6.445301488917836e+30
-11.111	100.0	-	0.0	101	141.882	-0.0	6.445301488917836e+30
11.111	-100.0	-	0.001	101	141.882	0.0	-6.445301488917836e+30
11.111	-100.0	-	0.0	101	141.882	0.0	-6.445301488917836e+30
11.111	-77.778	-	0.001	101	141.396	0.0	-5.0546766508480424e+30
11.111	-77.778	-	0.0	101	141.396	0.0	-5.0546766508480424e+30

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
11.111	-55.556	-	0.001	101	140.747	0.0	-3.6537130860774335e+30
11.111	-55.556	-	0.0	101	140.747	0.0	-3.6537130860774335e+30
11.111	-33.333	-	0.001	101	139.759	0.0	-2.229457125981929e+30
11.111	-33.333	-	0.0	101	139.759	0.0	-2.229457125981929e+30
11.111	-11.111	-	0.001	101	137.572	0.0	-7.472464963579115e+29
11.111	-11.111	-	0.0	101	137.572	0.0	-7.472464963579115e+29
11.111	11.111	-	0.001	101	137.572	0.0	7.472464963579115e+29
11.111	11.111	-	0.0	101	137.572	0.0	7.472464963579115e+29
11.111	33.333	-	0.001	101	139.759	0.0	2.2294571259819262e+30
11.111	33.333	-	0.0	101	139.759	0.0	2.2294571259819262e+30
11.111	55.556	-	0.001	101	140.747	0.0	3.6537130860774295e+30
11.111	55.556	-	0.0	101	140.747	0.0	3.6537130860774295e+30
11.111	77.778	-	0.001	101	141.396	0.0	5.0546766508480424e+30
11.111	77.778	-	0.0	101	141.396	0.0	5.0546766508480424e+30
11.111	100.0	-	0.001	101	141.882	0.0	6.445301488917836e+30
11.111	100.0	-	0.0	101	141.882	0.0	6.445301488917836e+30
33.333	-100.0	-	0.001	101	139.717	0.0	-2.1840850998272912e+30
33.333	-100.0	-	0.0	101	139.717	0.0	-2.1840850998272912e+30
33.333	-77.778	-	0.001	101	139.239	0.0	-1.7192520638193414e+30
33.333	-77.778	-	0.0	101	139.239	0.0	-1.7192520638193414e+30
33.333	-55.556	-	0.001	101	138.615	-0.0	-1.2585780443479254e+30
33.333	-55.556	-	0.0	101	138.615	-0.0	-1.2585780443479254e+30
33.333	-33.333	-	0.001	101	137.707	-0.0	-7.993671673954289e+29
33.333	-33.333	-	0.0	101	137.707	-0.0	-7.993671673954289e+29
33.333	-11.111	-	0.001	101	135.092	-0.0	-2.1619500743354995e+29
33.333	-11.111	-	0.0	101	135.092	-0.0	-2.1619500743354995e+29
33.333	11.111	-	0.001	101	135.092	-0.0	2.1619500743354995e+29
33.333	11.111	-	0.0	101	135.092	-0.0	2.1619500743354995e+29
33.333	33.333	-	0.001	101	137.707	-0.0	7.993671673954278e+29
33.333	33.333	-	0.0	101	137.707	-0.0	7.993671673954278e+29
33.333	55.556	-	0.001	101	138.615	-0.0	1.258578044347924e+30
33.333	55.556	-	0.0	101	138.615	-0.0	1.258578044347924e+30
33.333	77.778	-	0.001	101	139.239	0.0	1.7192520638193414e+30
33.333	77.778	-	0.0	101	139.239	0.0	1.7192520638193414e+30

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
33.333	100.0	-	0.001	101	139.717	0.0	2.1840850998272912e+30
33.333	100.0	-	0.0	101	139.717	0.0	2.1840850998272912e+30
55.556	-100.0	-	0.001	101	138.754	-0.0	-1.3488240089195604e+30
55.556	-100.0	-	0.0	101	138.754	-0.0	-1.3488240089195604e+30
55.556	-77.778	-	0.001	101	138.273	-0.0	-1.0607697408828806e+30
55.556	-77.778	-	0.0	101	138.273	-0.0	-1.0607697408828806e+30
55.556	-55.556	-	0.001	101	137.614	-0.0	-7.627917409563005e+29
55.556	-55.556	-	0.0	101	137.614	-0.0	-7.627917409563005e+29
55.556	-33.333	-	0.001	101	136.549	-0.0	-4.4799078337473146e+29
55.556	-33.333	-	0.0	101	136.549	-0.0	-4.4799078337473146e+29
55.556	-11.111	-	0.001	101	133.086	-0.0	7.928257563626995e+28
55.556	-11.111	-	0.0	101	133.086	-0.0	7.928257563626995e+28
55.556	11.111	-	0.001	101	133.086	-0.0	-7.928257563626995e+28
55.556	11.111	-	0.0	101	133.086	-0.0	-7.928257563626995e+28
55.556	33.333	-	0.001	101	136.549	-0.0	4.479907833747311e+29
55.556	33.333	-	0.0	101	136.549	-0.0	4.479907833747311e+29
55.556	55.556	-	0.001	101	137.614	-0.0	7.627917409562989e+29
55.556	55.556	-	0.0	101	137.614	-0.0	7.627917409562989e+29
55.556	77.778	-	0.001	101	138.273	-0.0	1.0607697408828806e+30
55.556	77.778	-	0.0	101	138.273	-0.0	1.0607697408828806e+30
55.556	100.0	-	0.001	101	138.754	-0.0	1.3488240089195604e+30
55.556	100.0	-	0.0	101	138.754	-0.0	1.3488240089195604e+30
77.778	-100.0	-	0.001	101	138.063	-0.0	-9.548421166261834e+29
77.778	-100.0	-	0.0	101	138.063	-0.0	-9.548421166261834e+29
77.778	-77.778	-	0.001	101	137.559	-0.0	-7.421861531721798e+29
77.778	-77.778	-	0.0	101	137.559	-0.0	-7.421861531721798e+29
77.778	-55.556	-	0.001	101	136.883	-0.0	-5.292629463673274e+29
77.778	-55.556	-	0.0	101	136.883	-0.0	-5.292629463673274e+29
77.778	-33.333	-	0.001	101	135.982	-0.0	-3.374133228146536e+29
77.778	-33.333	-	0.0	101	135.982	-0.0	-3.374133228146536e+29
77.778	-11.111	-	0.001	8	0.693	0.0	0.0
77.778	-11.111	-	0.0	8	0.693	0.0	0.0
77.778	11.111	-	0.001	8	0.693	0.0	-0.0
77.778	11.111	-	0.0	8	0.693	0.0	-0.0

x0	y0	alpha	tol	Iteraciones	f(x,y)	Min_x	Min_y
77.778	33.333	-	0.001	101	135.982	-0.0	3.374133228146536e+29
77.778	33.333	-	0.0	101	135.982	-0.0	3.374133228146536e+29
77.778	55.556	-	0.001	101	136.883	-0.0	5.292629463673262e+29
77.778	55.556	-	0.0	101	136.883	-0.0	5.292629463673262e+29
77.778	77.778	-	0.001	101	137.559	-0.0	7.421861531721798e+29
77.778	77.778	-	0.0	101	137.559	-0.0	7.421861531721798e+29
77.778	100.0	-	0.001	101	138.063	-0.0	9.548421166261834e+29
77.778	100.0	-	0.0	101	138.063	-0.0	9.548421166261834e+29
100.0	-100.0	-	0.001	101	137.537	-0.0	-7.342729140246998e+29
100.0	-100.0	-	0.0	101	137.537	-0.0	-7.342729140246998e+29
100.0	-77.778	-	0.001	101	137.047	-0.0	-5.746106152534511e+29
100.0	-77.778	-	0.0	101	137.047	-0.0	-5.746106152534511e+29
100.0	-55.556	-	0.001	101	136.438	-0.0	-4.238102208728897e+29
100.0	-55.556	-	0.0	101	136.438	-0.0	-4.238102208728897e+29
100.0	-33.333	-	0.001	101	135.807	0.0	-3.0915685644930514e+29
100.0	-33.333	-	0.0	101	135.807	0.0	-3.0915685644930514e+29
100.0	-11.111	-	0.001	8	0.693	-0.0	-0.001
100.0	-11.111	-	0.0	9	0.693	-0.0	0.0
100.0	11.111	-	0.001	8	0.693	-0.0	0.001
100.0	11.111	-	0.0	9	0.693	-0.0	-0.0
100.0	33.333	-	0.001	101	135.807	0.0	3.091568564493046e+29
100.0	33.333	-	0.0	101	135.807	0.0	3.091568564493046e+29
100.0	55.556	-	0.001	101	136.438	-0.0	4.2381022087288856e+29
100.0	55.556	-	0.0	101	136.438	-0.0	4.2381022087288856e+29
100.0	77.778	-	0.001	101	137.047	-0.0	5.746106152534511e+29
100.0	77.778	-	0.0	101	137.047	-0.0	5.746106152534511e+29
100.0	100.0	-	0.001	101	137.537	-0.0	7.342729140246998e+29
100.0	100.0	-	0.0	101	137.537	-0.0	7.342729140246998e+29