PHASE-I

Exhaustive Search + Bisection Method

GROUP: G7

MEMBERS: ANUPAM KHANDELWAL & KONARK JAIN

Exhaustive Search Algorithm

function exhaustive_search()

- Inputs: a, b, n, function_name
- Output: X (1X3 array initialized as [0 0 0])

```
delta ← (b-a)/n
x1 ← a
x2 ← x1 + delta
x3 ← x2 + delta
while x3 <= b
    y1 ← function_name(x1)
    y2 ← function_name(x2)
    y3 ← function_name(x3)
    if  y2 <= y1 & y2 <= y3
            X1 ← 1
            X2 ← x1
            X3 ← x3
            break
    else
            x1 ← x2
            x2 ← x3
            x3 ← x3 + delta
```

Bisection Method Algorithm

function bisection_search()

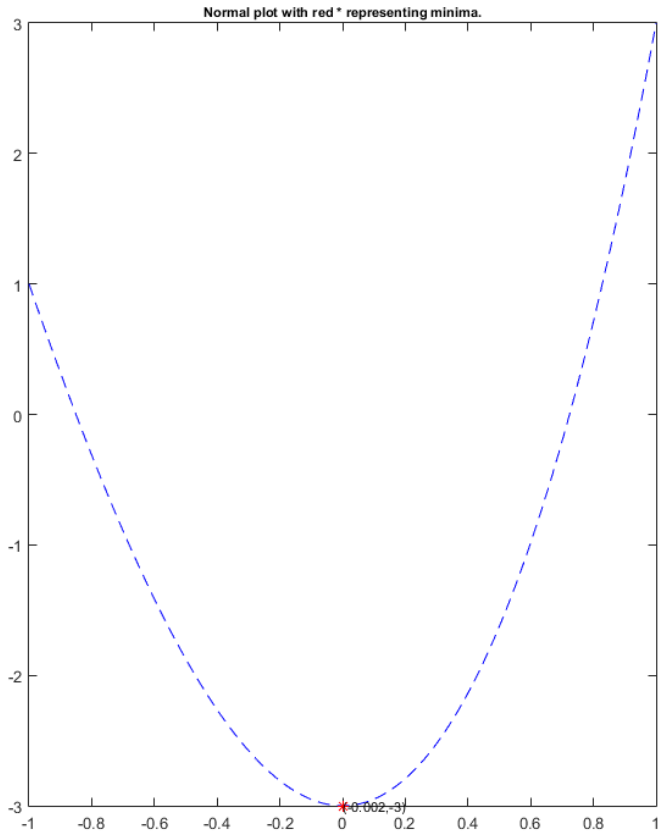
- Inputs: x1, x3, del_x, e, function_name
- Output: z

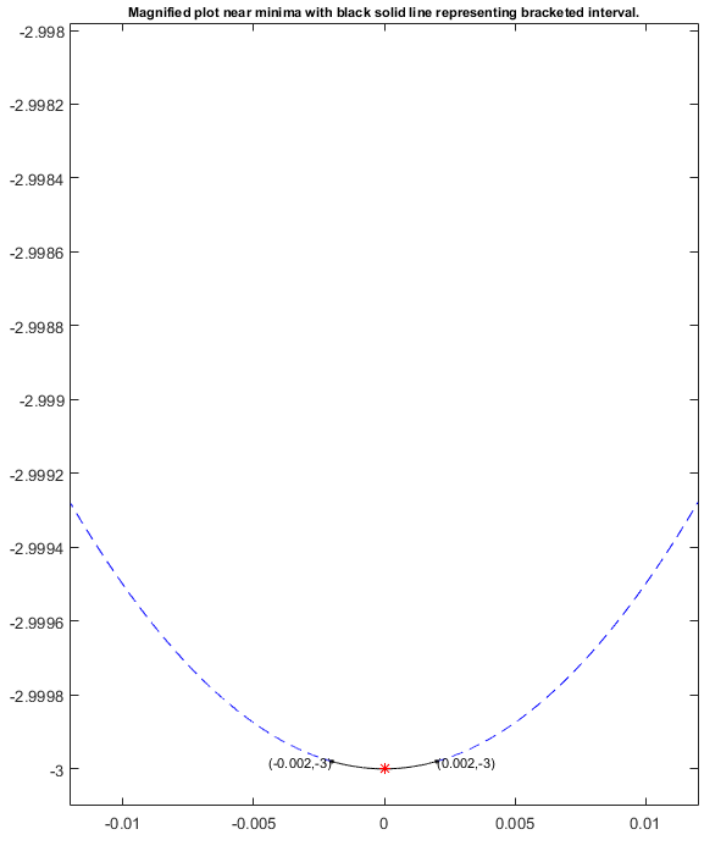
```
z1 ← x1
z2 ← x3
z ← (z1+z2)/2
dz ← (function_name(z+del_x)-function_name(z-del_x))/(2*del_x)
while |dz| > e
    if dz > 0
        z2 ← z
    else
        z1 ← z
    z ← z ← (z1+z2)/2
    dz ← (function_name(z+del_x)-function_name(z-del_x))/(2*del_x)
```

Combined Algorithm

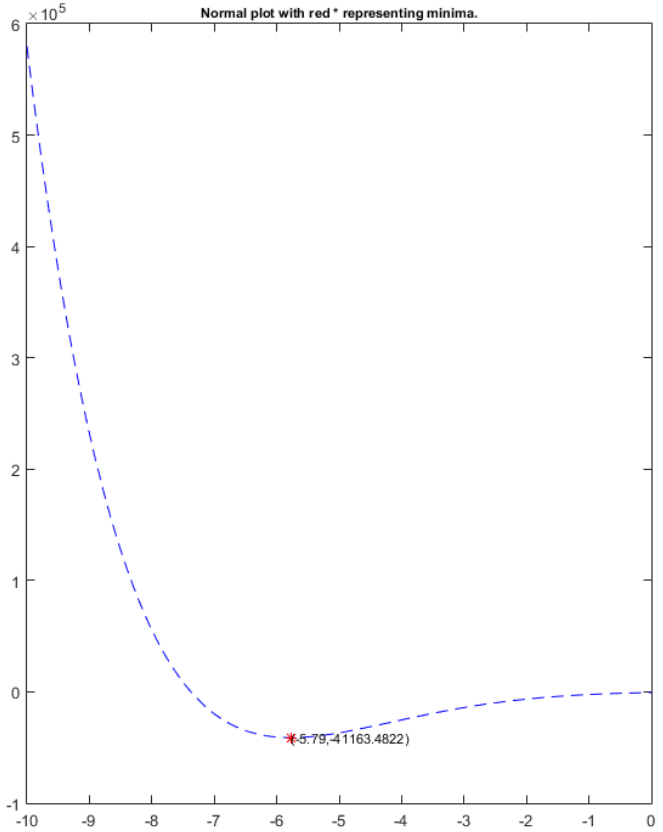
```
X = exhaustive_search(a, b, n, function_name)

if X_1 = 1
    // Successful exhaustive search call.
    minima = bisection_search(x1, x3, del_x, e, function_name)
else
    // Unsuccessful exhaustive search call implying monotonicity in the search interval.
    if function_name(a)  <= function_name(b)
            minima = a              // Monotonically increasing function.
    else
            minima = b              // Monotonically decreasing function.
```

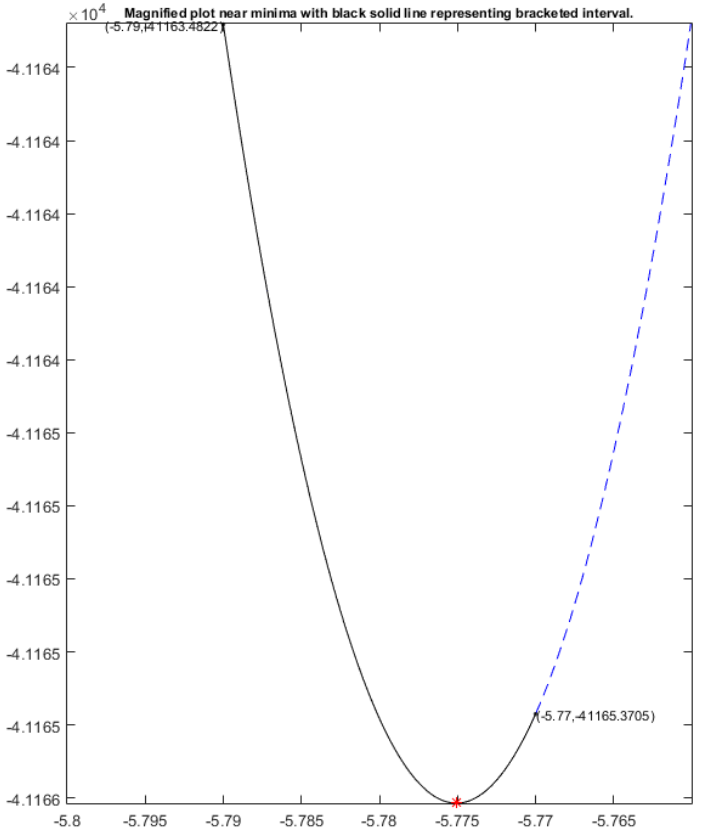
Minimize $f(x) = x^3 + 5x^2 - 3$ in (-1,1)



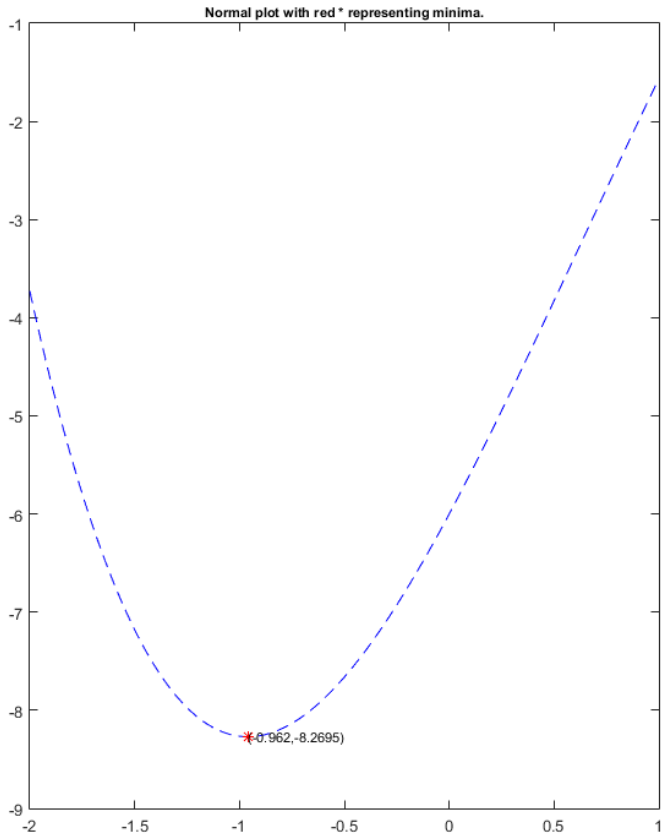


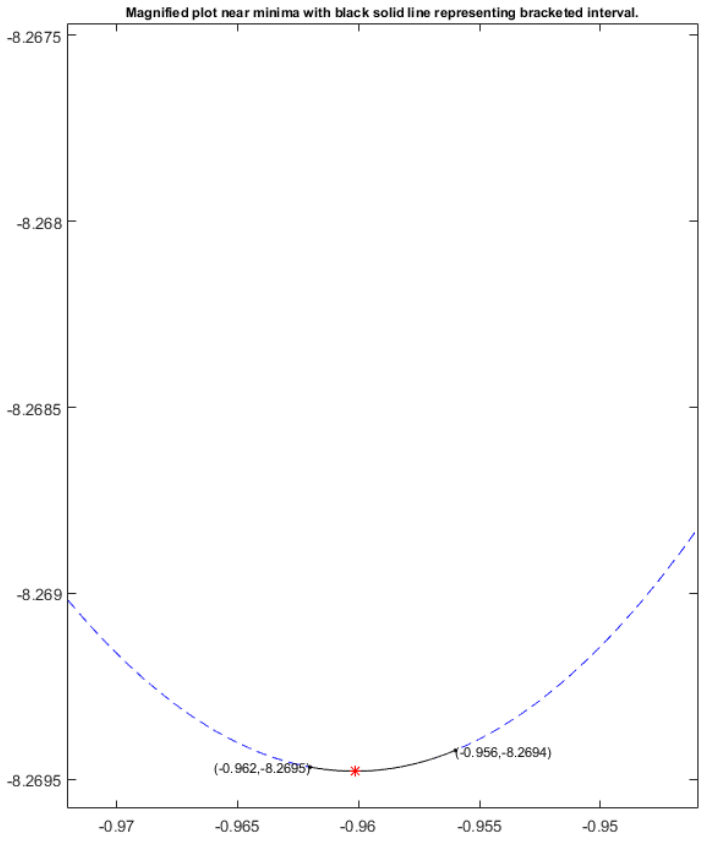
Minimize $f(x) = (x^2 - 1)^3 - (2x - 5)^4$ in (-10,0)



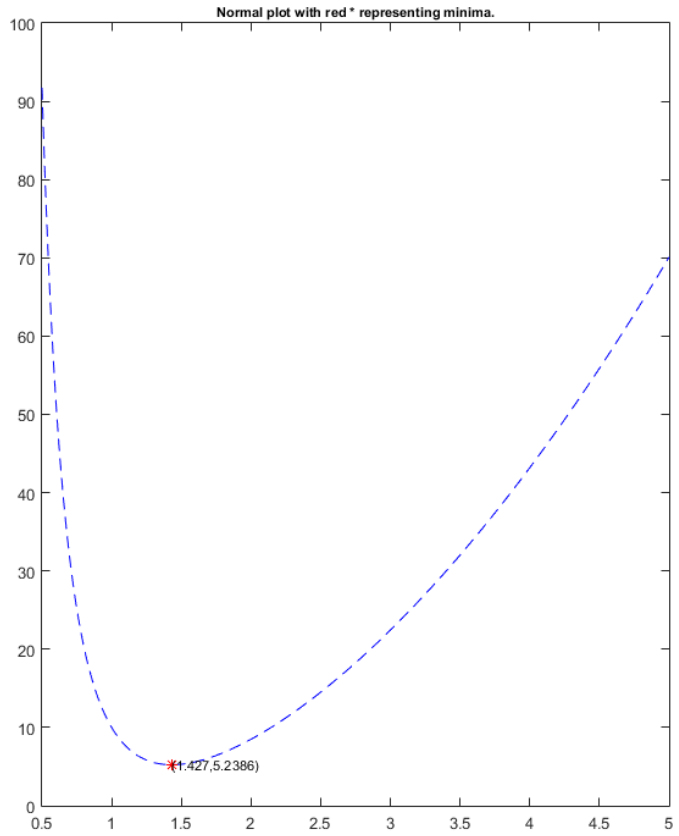


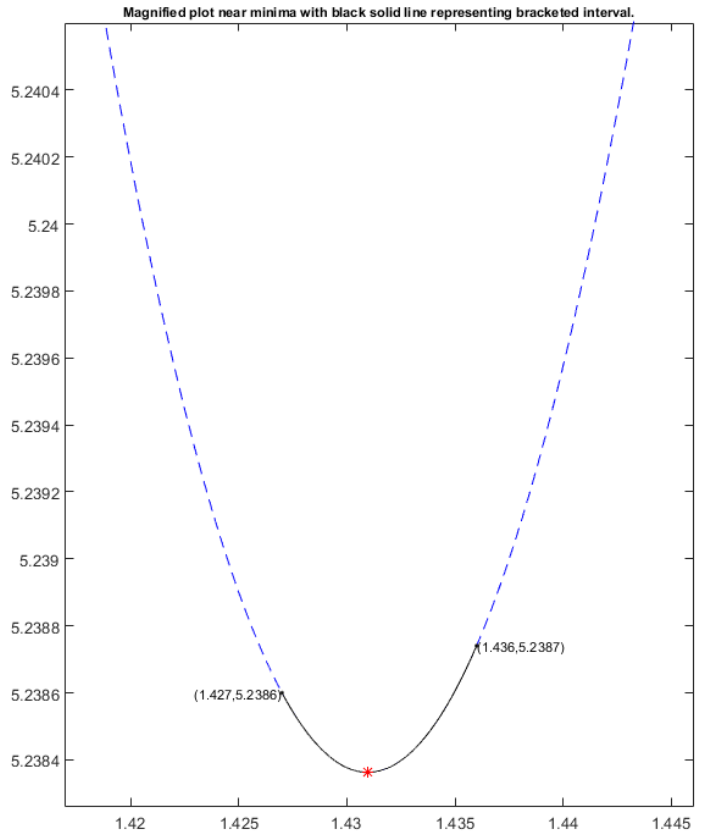
Minimize $f(x) = 2x + 2e^x - x^3 - 8$ in (-2,1)



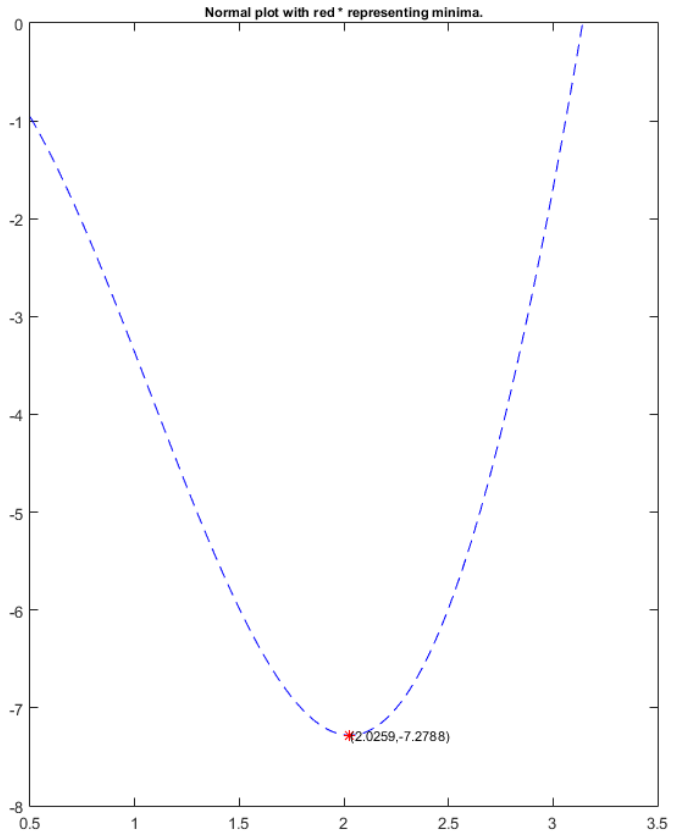


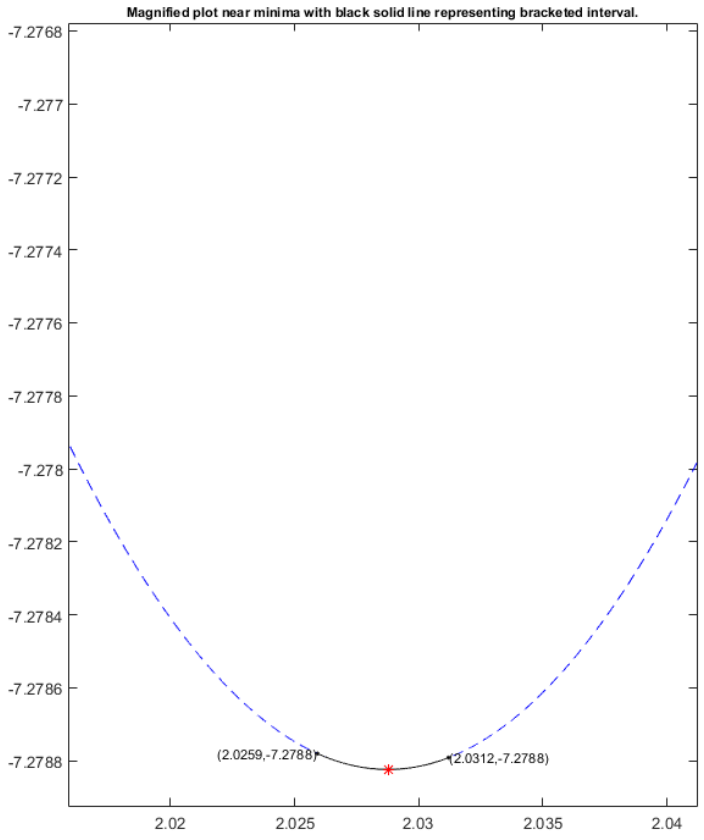
Minimize $f(x) = 3x^2 + \frac{12}{x^3} - 5$ in (0.5,5)



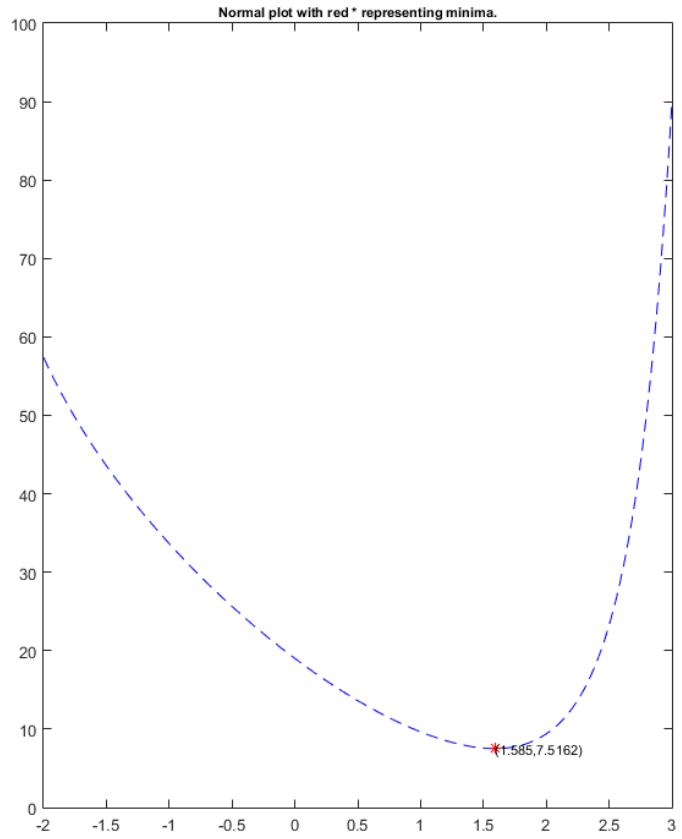


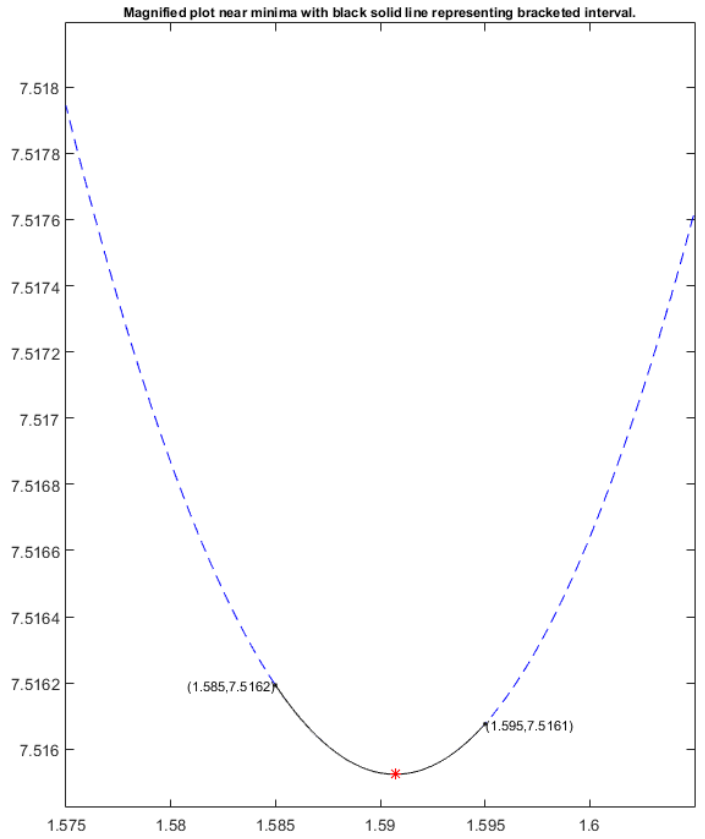
Minimize $f(x) = -4x(sinx)$ in (0.5,3.14)



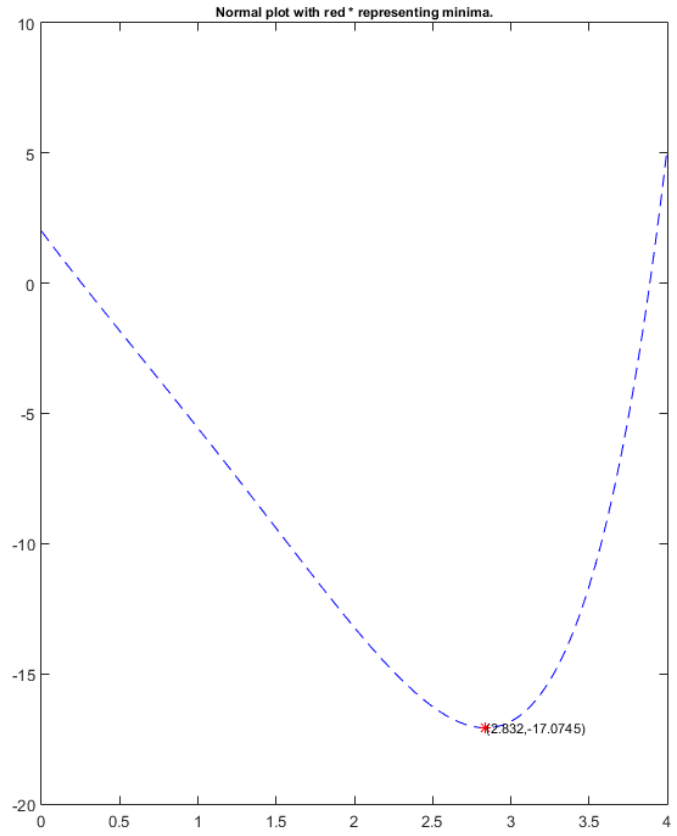


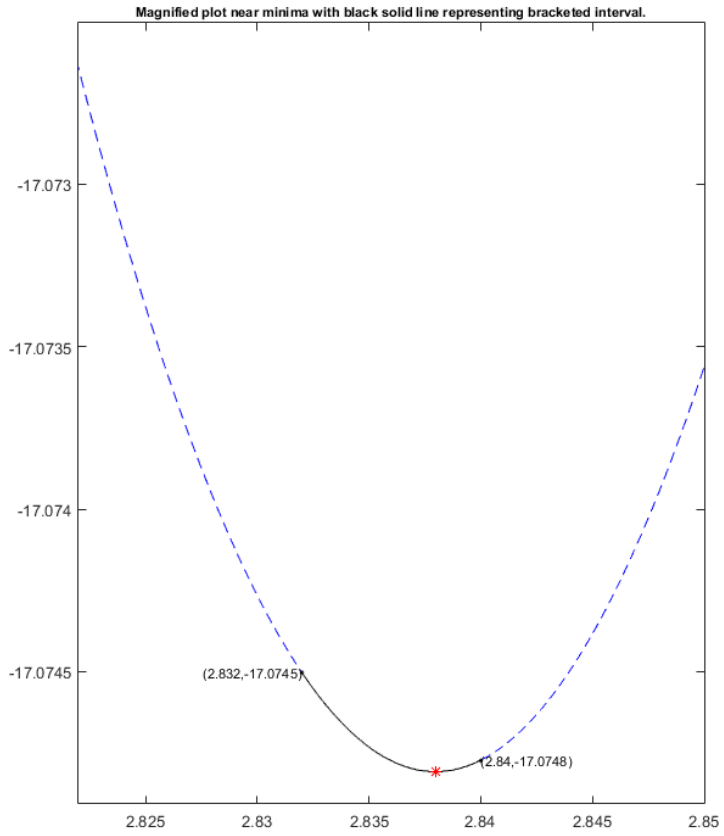
Minimize $f(x) = 2(x-3)^2 + e^{0.5x^2}$ in (-2,3)



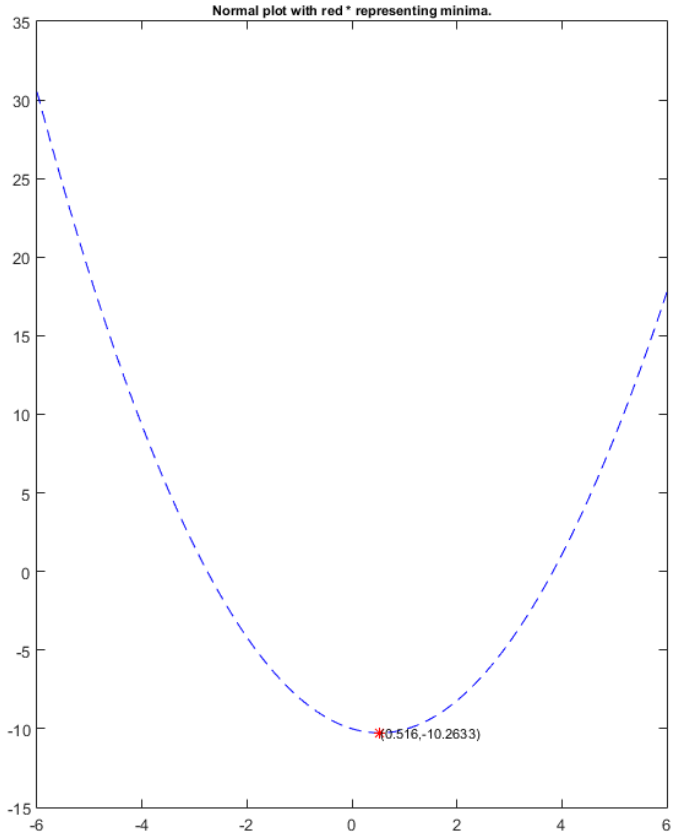


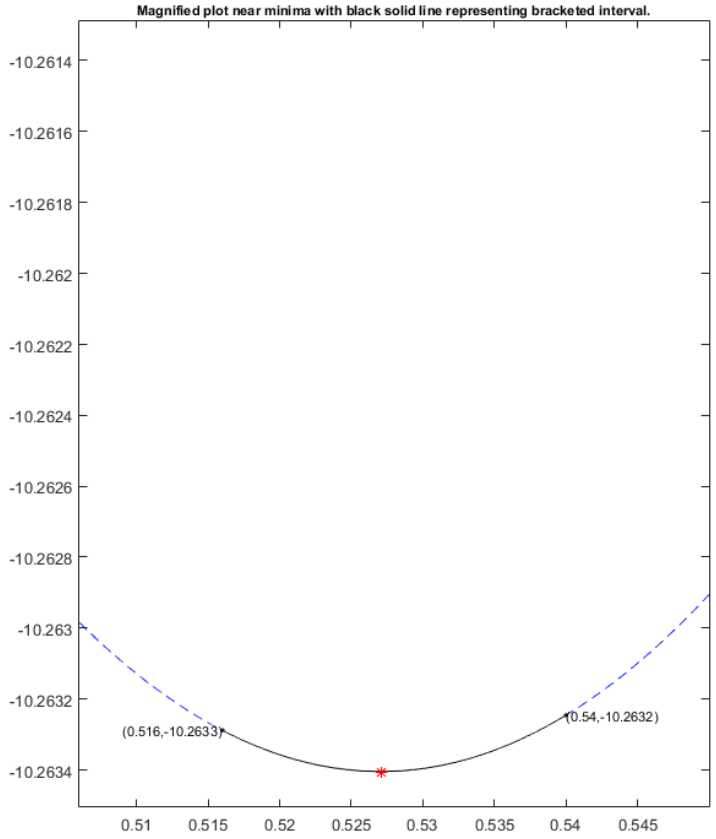
Minimize $f(x) = 2e^x - x^3 - 10x$ in (0,4)



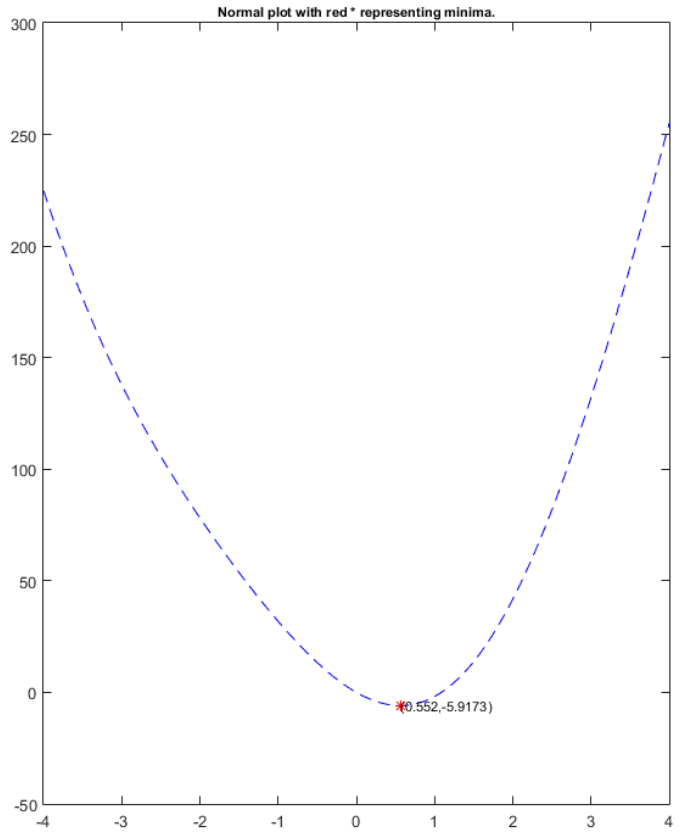


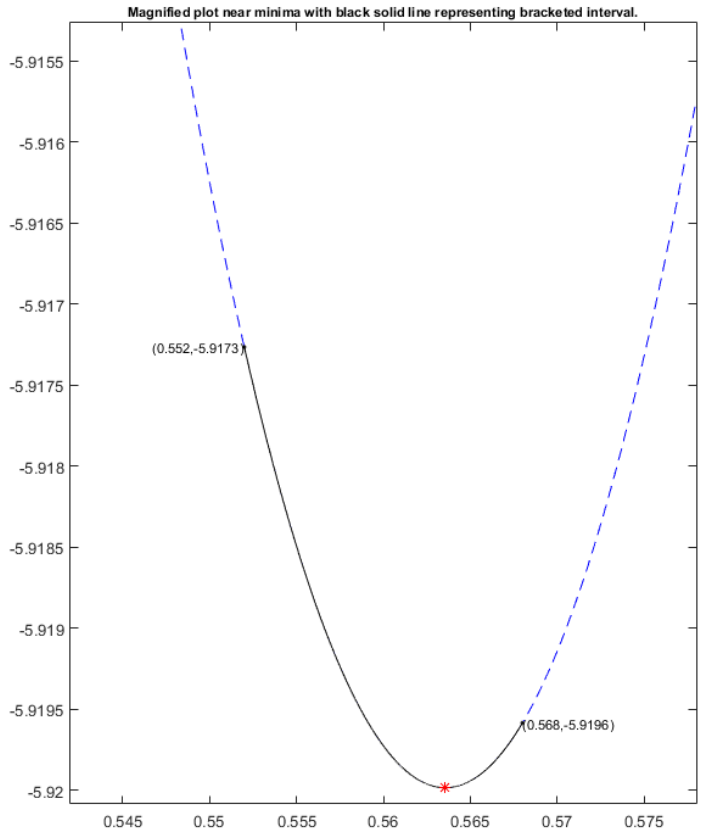
Minimize $f(x) = x^2 - 10e^{0.1x}$ in (-6,6)





Minimize $f(x) = 15x^2 - 20sinx$ in (-4,4)





Minimize $f(x) = (e^x - x^3)^2$ in (1,2)