HW6

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1 Problem 1

1.1 Part 1

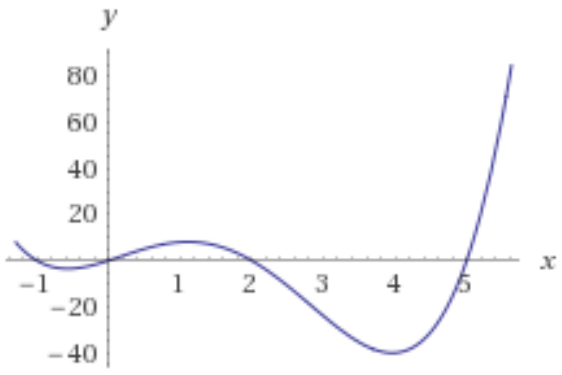

Figure 1: Graph of problem 1.1

$f(x) = x^4 - 6x^3 + 3x^2 + 10x$
$f'(x) = 4x^3 - 18x^2 + 6x + 10 = 0$
This has roots $x \approx -.57$, $x \approx 1.1$, and $x \approx 4$. Based on the graph, it is clear that $x \approx -.57$ and $x \approx -4$ are local minimizers, with $x \approx -4$ being the global minimizer.

1.2 Part 2

The feasible set of figure 2 is the green shaded region (including all of its boundaries). The local minimizers are the point $(-2, 0)$ as well as the segment of line $x_1 = 1$ that is in the feasible region (The left edge of the green shaded region on the right). The global minimizer is the point $(-2, 0)$.

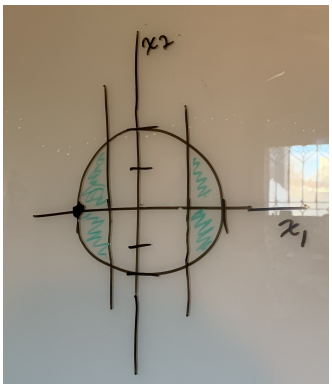

Figure 2: Graph of problem 1.2

2 Problem 2

2.1 Part 1

$$\nabla f(x,y,z) = \begin{pmatrix} 4x+y-6 \\ x+2y+z-7 \\ y+2z-8 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

The candidate has coordinates $x = 1.2$, $y = 1.2$, and $z = 3.4$.

2.2 Part 2

$$\nabla^2 f(x,y,z) = \begin{pmatrix} 4 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{pmatrix}$$

which has eigenvalues .83, 2.79, and 4.48, which are all positive. Thus $\nabla^2 f(x,y,z)$ is positive definite. So the candidate is a local minimum.

2.3 Part 3

2.4 Part 4

I obtained an optimal value of -30.4 with the same (roughly) values for x, y, and z. My MATLAB code is included as P2.m.

3 Problem 3

I'm really sorry, I've been dealing with some personal issues lately and I will do better on the next assignment.