## Department of Mechanical Engineering, IIT Bombay

## ME 782 Design Optimization, Assignment #3, August 13, 2024

1. Determine the value of the variables that will obtain an unconstrained local minimum of the following functions:

(a) 
$$f(x_1, x_2) = (3x_1^2 + 12x_2^2 + 10x_1)^2 + (24x_1x_2 + 4x_2 + 3)^2$$

(b) 
$$f(x_1, x_2) = (10x_1^3 - 10x_1 - x_2 - 2)^2 + (2x_2^3 - 10x_2 - x_1 - 3)^2$$

(c) 
$$f(x_1, x_2) = (x_1^2 + x_2^2 - 2)^2 + (10x_1^2 - 10x_2 - 5x_1 + 1)^2$$

(d) 
$$f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$$

(e) 
$$f(x_1, x_2) = -(x_1^3 + 12x_1x_2^2 + 2x_2^2 + 5x_1^2 + 3x_2)$$