

$$f = x_1^2 + 2x_2^2$$

$$\nabla f(x_1, x_2) = [2x_1, 4x_2]^T$$

Analyticky

$$\nabla f(1.0, 1.0) = [2.0, 4.0]^T$$

Numericky -- single sided

$$\nabla f(1.0, 1.0) = [3.0, 6.0]^T, [\Delta x_1, \Delta x_2]^T = [1, 1]^T$$

$$\nabla f(1.0, 1.0) = [2.5, 5.0]^T, [\Delta x_1, \Delta x_2]^T = [0.5, 0.5]^T$$

$$\nabla f(1.0, 1.0) = [2.1, 4.2]^T, [\Delta x_1, \Delta x_2]^T = [0.1, 0.1]^T$$

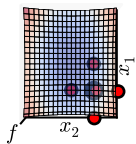
$$\nabla f(1.0, 1.0) = [2.01, 4.02]^T, [\Delta x_1, \Delta x_2]^T = [0.01, 0.01]^T$$

Numericky -- central differences

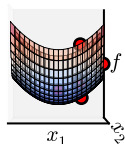
$$\nabla f(1.0, 1.0) = [2.0, 4.0]^T, [\Delta x_1, \Delta x_2]^T = [1, 1]^T$$

$$\nabla f(1.0, 1.0) = [2.0, 4.0]^T, [\Delta x_1, \Delta x_2]^T = [0.01, 0.01]^T$$

Top



Front



Side

