

1. Measurement

- a) Find the rate of change in the surface in the x -direction at the **blue** dot on your surface. Include units.

$$\frac{\partial f}{\partial x} = \underline{\hspace{2cm}}$$

- b) Find the rate of change in the surface in the y -direction at the **blue** dot on your surface. Include units.

$$\frac{\partial f}{\partial y} = \underline{\hspace{2cm}}$$

- c) Draw an arbitrary vector $\vec{u}$ at the blue dot *on the contour mat*. What are its components?

$$\vec{u} = \underline{\hspace{2cm}}$$

- d) Find the rate of change in the surface in the $\vec{u}$ -direction. Include units.

$$\frac{df}{ds} = \underline{\hspace{2cm}}$$

2. Computation

- a) Determine the gradient of f at the blue dot.

$$\vec{\nabla} f = \underline{\hspace{2cm}}$$

- b) Use the Master Formula to express $\frac{df}{ds}$ in terms of $\vec{\nabla} f$, and compute the result.

$$\frac{df}{ds} = \underline{\hspace{2cm}}$$

3. Comparison

- Compare your answers.