

# Directional Derivatives MCQ Questions

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## Questions

- Q1. The slope in any direction pointed by the vector  $\hat{\mathbf{u}}$  can be calculated using the directional derivative.
- True
  - False
- Q2. Find the gradient  $\nabla f(2, 3)$ , if  $f(x, y) = x^3y$ .
- $\nabla f(2, 3) = 24\mathbf{i} + 24\mathbf{j}$
  - $\nabla f(2, 3) = 24\mathbf{i} + 8\mathbf{j}$
  - $\nabla f(2, 3) = 8\mathbf{i} + 8\mathbf{j}$
  - $\nabla f(2, 3) = 8\mathbf{i} + 24\mathbf{j}$
- Q3. Find the unit vector in the direction  $(1, 2)$ .
- $\hat{\mathbf{u}} = \langle \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}} \rangle$
  - $\hat{\mathbf{u}} = \langle \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}} \rangle$
  - $\hat{\mathbf{u}} = \langle 1, 2 \rangle$
  - $\hat{\mathbf{u}} = \langle \frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}} \rangle$
- Q4. Find the directional derivative of  $f(x, y) = x^3y$  in the direction  $(1, 2)$  at the point  $(2, 3)$ .
- $D_u f(2, 3) = \frac{40}{\sqrt{5}}$
  - $D_u f(2, 3) = 40$
  - $D_u f(2, 3) = \frac{30}{\sqrt{5}}$

d.  $D_u f(2, 3) = \sqrt{5}$

Q5. Find the directional derivative  $D_u f$ , when  $\theta = 0$ .

a.  $D_u f = |\nabla f|$

b.  $D_u f = -|\nabla f|$

Q6. Find the directional derivative  $D_u f$ , when  $\theta = \pi$ .

a.  $D_u f = |\nabla f|$

b.  $D_u f = -|\nabla f|$

## Answer Key

Q1. True

Q2.  $\nabla f(2, 3) = 24\mathbf{i} + 8\mathbf{j}$

Q3.  $\hat{\mathbf{u}} = \langle \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}} \rangle$

Q4.  $D_u f(2, 3) = \frac{40}{\sqrt{5}}$

Q5.  $D_u f = |\nabla f|$

Q6.  $D_u f = -|\nabla f|$