Multiple choice questions - Multivariable calculus

Year: University Year 1 · 10

Question 1 $f = x^2y$: $f_y =$

- ◯ **A.** $2xy$
- ◯ **B.** x^2
- ◯ **C.** x^2y
- ◯ **D.** $2x$

Question 2 The gradient points in the direction of

- ◯ **A.** steepest ascent
- ◯ **B.** steepest descent
- ◯ **C.** a level curve
- ◯ **D.** zero change

Question 3 A critical point with D is a

- ◯ **A.** minimum
- ◯ **B.** maximum
- ◯ **C.** saddle point
- ◯ **D.** undefined

Question 4 In polar coordinates $dA =$

- ◯ **A.** $dr\,d\theta$
- ◯ **B.** $r\,dr\,d\theta$
- ◯ **C.** $r^2dr\,d\theta$
- ◯ **D.** $\theta\,dr\,d\theta$

Question 5 $\int_0^1 \int_0^1 x\,dy\,dx =$

- ◯ **A.** 0
- ◯ **B.** $1/2$
- ◯ **C.** 1
- ◯ **D.** 2

Question 6 The gradient is perpendicular to

- ◯ **A.** level curves
- ◯ **B.** the x-axis

- ◯ **C.** the z-axis
- ◯ **D.** nothing

Question 7 $D_{\mathbf{u}}f$ uses

- ◯ **A.** any vector
- ◯ **B.** a unit vector
- ◯ **C.** the zero vector
- ◯ **D.** a tangent plane

Question 8 $f = x^2 + y^2$ has at the origin a

- ◯ **A.** saddle
- ◯ **B.** minimum
- ◯ **C.** maximum
- ◯ **D.** none of these

Question 9 Lagrange multipliers solve

- ◯ **A.** $\nabla f = 0$
- ◯ **B.** $\nabla f = \lambda \nabla g$ and $g = c$
- ◯ **C.** $f = g$
- ◯ **D.** $f_x = f_y$

Question 10 $\iint_R 1\, dA$ gives

- ◯ **A.** volume
- ◯ **B.** area of R
- ◯ **C.** perimeter
- ◯ **D.** zero

Answer grid - Multivariable calculus

Year: University Year 1

Question	Answer	Explanation
1	**B**	Treat x as constant.
2	**A**	Property of ∇f.
3	**C**	Hessian determinant test.
4	**B**	Jacobian r.
5	**B**	$\int_0^1 x\,dx$.
6	**A**	On a level curve f is constant.
7	**B**	$\mathbf{u}$ has length 1.
8	**B**	$D = 4 > 0$, $f_{xx} > 0$.
9	**B**	Constrained optimisation.
10	**B**	Area.