Moderate | Assistant Engineer (Electrical), Clas | 2025 | Building Department

Evaluate the surface integral (3x i + 2y j). dS, where S is the sphere given by x + y + z = 9.

A 120

B **180** Correct

C 240

D 300

Correct Answer: B

Full Detailed Explanation

Concept & ReasoningA closed-surface flux integral is usually faster through the divergence theorem than by parametrizing the sphere. The divergence of 3x i + 2y j is constant: (3x)/ x + (2y)/ y + (0)/ z = 5.The sphere radius is 3, so its volume is (4/3) (3)=36 . Integrating constant divergence 5 over that volume gives 180 . This is the net outward flux through the entire spherical surface.How to Solve It in the ExamClosed surface + simple divergence use divergence theorem immediately.Important Exam PointConfirm the surface is closed before replacing a surface integral with a volume integral.Related Revision PathThis question sits in the revision path Electromagnetic Fields Vector Calculus Divergence Theorem .

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