

MATH 275 – Section 002 – Quiz 12

You may work with other class members on this quiz, but you may *not* receive assistance from people not in MATH 275 (Section 002). You must show all of your work to receive full credit. Do all your work on other sheets of paper and be sure to staple all the pieces of paper together or YOU WILL GET A 'ZERO' ON THE QUIZ. Do not use decimal approximations unless asked to do so. Your work on this quiz must be handed in by Monday, 26 April 2004 at 12:40 p.m. GOOD LUCK!

1) Prove that the flux/divergence form of Green's Theorem and the circulation/curl form of Green's Theorem are equivalent. (Hints: Write down one of the forms. Let $P = M$ and $Q = N$ and then write down the resulting equation. Now, reassign values to P and Q to obtain the other form of Green's Theorem.)

2) Let T be the triangle in the x - y plane that is bounded by $y = x$, $y = 2x$, and $x = 2$. Let \mathbf{F} be a velocity field given by

$$\mathbf{F} = \begin{bmatrix} xy \\ -xy \end{bmatrix}.$$

a) Calculate the flux of \mathbf{F} across T and give a physical interpretation of the sign of your answer.

b) Repeat part a) for the circulation of \mathbf{F} around T .

3) Let S be the portion of the surface $z = x^2 + y^2$ that lies between the planes $z = 1$ and $z = 4$.

a) Find the area of surface S .

b) Let

$$\mathbf{F} = \begin{bmatrix} xy \\ -x^2 \\ z \end{bmatrix}.$$

Find the flux of \mathbf{F} across S where positive flux is in the direction away from the z -axis.