Name_____ ID_____

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MATH 251 Quiz 7 Spring 2006

Sections 506 P. Yasskin

Multiple Choice: (4 points each)

1. (4 points) If $\vec{F} = (2yz, -2xz, x^2z + y^2z)$, compute $\vec{\nabla} \cdot \vec{F}$.

a. $2yz - 2xz + 2x + 2y - 4z$

b. $x^2 + y^2$

c. $(2yz + 2x, 2xz - 2y, -4z)$

d. $(0, 0, x^2 + y^2)$

e. $(2yz + 2x, 2y - 2xz, -4z)$

2. (4 points) If $\vec{F} = (2yz, -2xz, x^2z + y^2z)$, compute $\vec{\nabla} \times \vec{F}$.

a. $2yz - 2xz + 2x + 2y - 4z$

b. $x^2 + y^2$

c. $(2yz + 2x, 2xz - 2y, -4z)$

d. $(0, 0, x^2 + y^2)$

e. $(2yz + 2x, 2y - 2xz, -4z)$

3. (4 points) If $\vec{F} = (2yz, -2xz, x^2z + y^2z)$, compute $\vec{\nabla} \cdot \vec{\nabla} \times \vec{F}$.

a. $2x - 2y$

b. $2x + 2y$

c. $(2, 2, -4)$

d. 0

e. undefined

4. (8 points) Find the mass and center of mass of a wire in the shape of the semicircle $x^2 + y^2 = 4$ with $y \geq 0$ if the density is $\rho(x,y) = y$.

Note: By symmetry $\bar{x} = 0$. So you just need to compute M and $\bar{y}$.

5. (8 points) Compute $\iint \vec{\nabla} \times \vec{F}\, d\vec{S}$ over the cone $z = \sqrt{x^2 + y^2}$ for $z \leq 4$ with normal pointing down and out, for the vector field $\vec{F} = (2yz, -2xz, x^2z + y^2z)$.

Note: The cone may be parametrized by $\vec{R}(r,\theta) = (r\cos\theta, r\sin\theta, r)$. Follow these steps:

$\vec{N} =$

$\vec{e}_r =$

$\vec{e}_\theta =$

$\vec{\nabla} \times \vec{F} =$

$\vec{\nabla} \times \vec{F}\left(\vec{R}(r,\theta)\right) =$

$\vec{\nabla} \times \vec{F} \cdot \vec{N} =$

$\iint \vec{\nabla} \times \vec{F}\, d\vec{S} =$