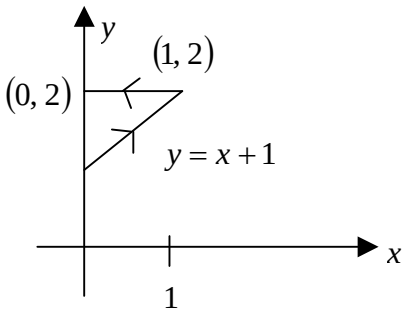
Math 251 Practice Exam 4 Name_____
Pericak-Spector

1. Compute the line integral $\int_C (x^2 + y)\, ds$ along



2. Compute the line integral $\int_C -y\sqrt{x^2 + y^2}\, dx + x\sqrt{x^2 + y^2}\, dy$

Where C is the boundary region that is BETWEEN the curves

$$y = +\sqrt{x - x^2} \text{ and } y = 0$$

Hint: The top curve, $y = \sqrt{x - x^2}$ is $r = \cos\theta$, $0 \le \theta \le \frac{\pi}{2}$ in polar coordinates.

3. Compute the surface integral $\iint_S e^{x^2+y^2}\, dS$

Where S is the SURFACE OF THE CONE

$$z = \sqrt{x^2 + y^2} \text{ and } x^2 + y^2 \le \ln \pi$$

4. Compute the surface integral $\iint_S \mathrm{F} \cdot \mathrm{N} dS$

Where *S* is the surface of the solid that is bounded above by the cone

$$z = 1 - \sqrt{x^2 + y^2}$$

and below by the sphere

$$x^2 + y^2 + z^2 = 1$$

N is the outward unit normal to *S*, and **F** is the vector field

$$\mathbf{F} = \langle x, y, z \rangle$$

5. Compute the surface integral $\iint_S \text{curl H} \cdot \mathbf{N} dS$

Where *S* is the portion of the surface

$$4x^2 + 9y^2 + z^2 = 1$$

that is above the plane $z = 0$, the *z* component of **N** points in the $\langle 0, 0, 1 \rangle$ direction, H is the vector field

$$\mathrm{H} = \left\langle zx^3 - y, x - zy^3, x^4 y^4 \right\rangle$$

6. Find the area of the surface given by $f(x, y) = \sqrt{x^2 + y^2}$ over the region given by $R = \{(x, y) : x^2 + y^2 \le 1\}$.

Math 251 Practice Exam 4 Answers (to the best of my ability)
K. Pericak-Spector

1. $\dfrac{14+11\sqrt{2}}{6}$

2. $\dfrac{2}{3}$

3. $\sqrt{2}\ \pi(\pi-1)$

4. 3π

5. $\dfrac{\pi}{3}$

6. $\pi\sqrt{2}$