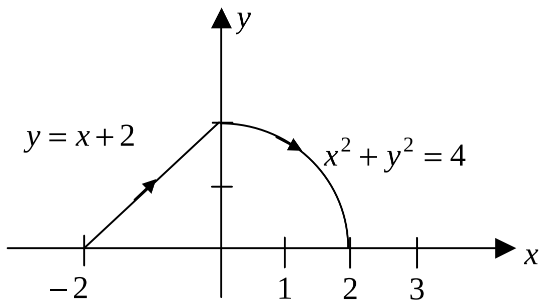
Math 251 Makeup Exam 4 Name____________________

Pericak-Spector

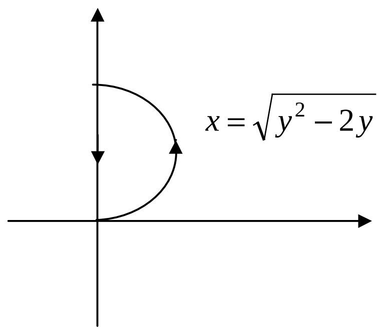
[20] 1. Compute the line integral $\int_C x^2 \, ds$ along



[20] 2. Compute the line integral $\oint_C \left(e^{x^2}\sin x^3 - y^2\right)dx + \left(\frac{y^3}{y^5+y^2} + x\right)dy$

where $C$ is the boundary of the curve found by starting at (0,0) and proceeding along the curve $x = \sqrt{2y - y^2}$ until you get to the $y$-axis and then going back to the origin.

Hint: $x = \sqrt{2y - y^2}$ can be written as $r = 2\sin\theta$.



[20] 3. Compute the surface integral $\iint_S z(x^2 + y^2)$ where $S$ is the portion of the parabolid $z = 4 - x^2 - y^2$ where $z \geq 0$.

[20] 4. Compute the surface integral $\iint_S \mathbf{F} \cdot \mathbf{N}\ dS$ where $S$ is the surface of the hemisphere $x^2 + y^2 + z^2 = 9$ and plane $z = 0$. **N** is the outward unit normal to *S*, and **F** is the vector field

$$\mathbf{F} = \left\langle y^2 + z, x^2 y - 3z^3, y^2 z + 3xy \right\rangle.$$

[20] 5. Compute the surface integral $\iint_S \text{curl } \mathbf{H}\cdot\mathbf{N}\, dS$ where $S$ is the portion of the surface of the plane $x+2y+z=16$ where $(x-1)^2+y^2\le 4$ the $z$ component of $\mathbf{N}$ points in the $\langle 0,0,1\rangle$ direction, H is the vector field $\mathrm{H}=\langle y,-x,x\rangle$.