MAC 2313 Calculus 3 **Mini-Test 4** 3 Mar 2004

**Directions:** Show **ALL** work for credit; Give **EXACT** answers when possible; Start each problem on a **SEPARATE** page; Use only **ONE** side of each page; Be neat; Leave margins on the left and top for the **STAPLE**; Calculators can be used for graphing and calculating only; Nothing written on this page will be graded;

1. Sketch the region of integration and then change the order of integration of

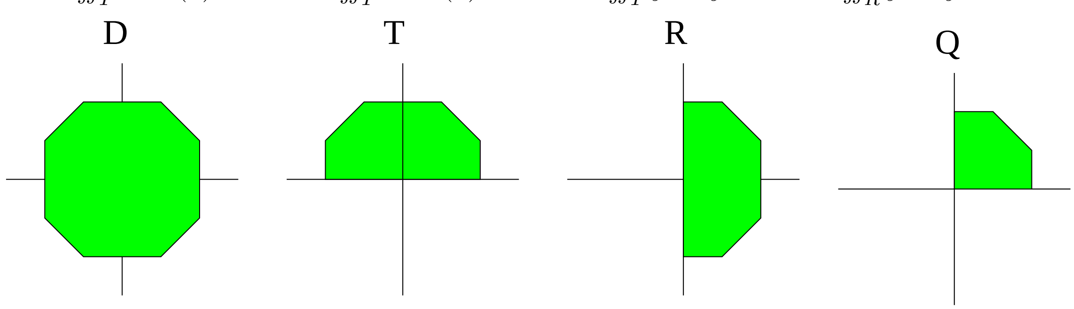
$$\int_0^1 \int_{\sqrt{y}}^1 f(x,y)\,dx\,dy$$

2. Let $A(0,0)$, $B(5,0)$ and $C(3,4)$. Find the coordinates of the point $P$ in the $xy$-plane so the sum of the distance squares $\|\overrightarrow{PA}\|^2+\|\overrightarrow{PB}\|^2+\|\overrightarrow{PC}\|^2$ is minimum.

3. The regions pictured below are inside the unit circle, decide if the following double integrals are positive, negative or zero.

$A=\iint_D x^2+y^2\,dA$ $\quad B=\iint_T 5y\,dA$ $\quad C=\iint_T 5x\,dA$ $\quad D=\iint_R 5x\,dA$ $\quad E=\iint_Q 0\,dA$

$F=\iint_T -\sin(x)\,dA$ $\quad G=\iint_T -\cos(x)\,dA$ $\quad H=\iint_T y^3-y\,dA$ $\quad I=\iint_R y^3-y\,dA$ $\quad J=\iint_R x+y^2\,dA$




4. Use your TI-89 to find all the critical points of the function $f(x,y)=8y^3+12x^2-24xy$, then show how you would obtain these critical points by hand. Classify these local extrema by filling out a table like the one below, with a separate line for each critical point.

| $(x,y)$ | $f_{xx}$ | $f_{yy}$ | $f_{xy}$ | big D | Classification |
|---|---|---|---|---|---|
| ? | ? | ? | ? | ? | ? |

5. Use Lagrange multipliers to find the maximum and minimum **VALUES** of $f(x,y)=x^2-y$ subject to the constraint that $x^2+y^2=4$.