Extra problems.

- **POLAR** Change to polar $x = 3$; $x^2 + y^2 = 9$; $x = -y^2$; $x + y = 9$; $x^2 + y^2 = 2cx$;$x^2 - y^2 = 1$. Change to Cartesian $r = 2$; $r\cos\theta = 1$; $r = 3\sin\theta$; $r = 2\sin\theta + 2\cos\theta$; $r = \csc\theta$; $r = \tan\theta\sec\theta$.

- **LIMIT** Do the following have limits? (Hint: convert to polar.)

$$\lim_{(x,y)\to(0,0)} \frac{x^2 - y^2}{x^2 + y^2} \qquad \lim_{(x,y)\to(0,0)} \frac{x^3 - y^3}{x^2 + y^2}$$

- **SKEW LINES** Find the minimum of $f(s,t) =$ the distance-squared between the points on the two lines $x = 1; y = 1; z = t$ and $x = 3 + s; y = 0; z = -s$ using chapt 15 techniques, also find the points on the two lines nearest each other.

- **LAGRANGE** Find the maximum and minimum values of $f(x, y, z) = x+2y+3z$ subject to the two constraints $x^2+y^2+z^2 = 1$ and $x+y+z = 1$.

- **TRIPLE INTEGRAL** Change the order of integration of

$$\int_0^1 \int_{\sqrt{x}}^1 \int_0^{1-y} f\,dz\,dy\,dx$$

  in the orders $dx\,dy\,dz$ and $dy\,dz\,dx$. See region2.mws in the maple subdirectory.

- **EULER** Consider the vector field $\vec{F} = \langle -y - x/10, x - y/10\rangle$

- A. Show $\vec{r}(t) = \left\langle e^{-t/10}\cos t, e^{-t/10}\sin t\right\rangle$ is a flow for $\vec{F}$

- B. Use Euler's method to approximate the flow which starts at $(1, 0)$ by completing a table that starts like the one below with as much accuracy has your TI-89 can give. [Check to see that you are in both radian mode and using the Euler method]. Do five steps of size $\Delta t = 0.1$