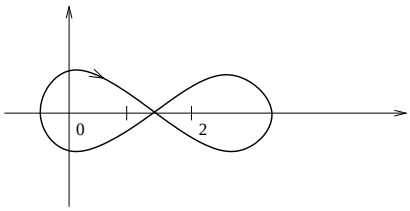
**Fall 2009 - Math 463 Section 0201**
**Complex Variables for Scientists and Engineers**
Homework #8 - Due Thursday November 5th **in class**

1. Evaluate the following complex integrals (all simple closed contours are oriented positively)
   (a) $\displaystyle\int_C ze^z\,dz$ where $C$ is the circle $|z-i|=1$.
   (b) $\displaystyle\int_C \frac{ze^z}{(z-i)^2}\,dz$ where $C$ is circle $|z|=2$.
   (c) $\displaystyle\int_C e^z\,dz$ where $C$ is the straight line from $-i$ to $2+i$.
   (d) $\displaystyle\int_C \frac{1}{z^2(z^2+1)}\,dz$ where $C$ is the circle $|z-i|=\frac{3}{2}$.
   (e) $\displaystyle\int_C x-iy^2\,dz$ where $C$ is the straight line from 0 to $1+i$.
   (f) $\displaystyle\int_C \left(\frac{e^{2iz}}{z^4}+\frac{z^4}{(z-i)^3}\right)dz$ where $C$ is the circle $|z|=6$.

2. Evaluate the integral
$$\int_C \frac{3z+1}{z(z-2)^2}\,dz$$
where $C$ is the following figure-eight contour:




3. Find the limit (if it exists) of the following sequences:
   (a) $z_n=\frac{3+ni}{n+2ni}$
   (b) $z_n=5i^n$
   (c) $z_n=\left(\frac{1+i}{4}\right)^n$ (Hint: You can use polar coordinates).

4. Determine whether the given series is convergent or divergent. If convergent, find its sum.
   (a) $\displaystyle\sum_{n=0}^{\infty}(1-i)^n$
   (b) $\displaystyle\sum_{n=0}^{\infty}\left(\frac{i}{2}\right)^n$
   (c) $\displaystyle\sum_{n=0}^{\infty}\frac{1}{2}i^n$
   (d) $\displaystyle\sum_{n=0}^{\infty}3\left(\frac{2}{1+2i}\right)^n$