Continuous Assessment

Consider the non-linear mapping

$$x_{n+1} = \frac{ax_n}{1 - x_n^2}$$

where a is a contol parameter.

6. Find all the 1-cycles and establish when they are stable. **[5]**

7. Find all the 2-cycles and establish when they are stable. **[5]**

8. Find the algebraic relationship between $\tan \pi y$ and $\tan \frac{\pi y}{2}$. **[5]**

9. Employ the transformation $x_n = \tan \frac{\pi y_n}{2}$ to map this non-linear map onto a linear map that you should determine for a value of a that you should also determine. **[5]**

10. How many n-cycles does this linear map have for each integer n with $n < 6$? **[5]**