

MATLAB routines

The following routines in MATLAB:

bfunc.m, bfuncTAY.m, ibfunc.m

calculate some of the functions mentioned in the publication 'A Note on Exact Solutions of the Logistic Map', MF Maritz, to appear in Chaos (2020)'.

```
function y=bfunc(la,x)
%
%      y=bfunc(la,x)
%
%      --- Base function for the Logistic Map
%
%      la inside [2,4]
%      x inside [0, infty)

ep=10^(-10);
for j=1:length(x)
    k=ceil(-2*log(ep/x(j))/log(la));
    xo=x(j)*la^(-k/2);
    yo=bfuncTAY(la,xo);
    for kk=1:k, yo=la*yo*(1-yo); end
    y(j)=yo;
end
```

```

function y=bfuncTAY(la,x)
%
%      y=bfuncTAY(la,x)
%
%      --- Taylor series for the Base function
%      of the Logistic Map
%
%      la in [2,4]
%      for x in [0, 0.2], the function value
has accuracy < 10^-14

y=x.^2 + x.^4/(1 - la) + (2*x.^6)/((-1 +
la)^2*(1 + la)) ...
- (x.^8*(5 + la))/((-1 + la)^3 *(1 + la)*(1 +
la + la^2)) ...
+ (2*x.^10*(7 + 3*la + 2*la^2))/((-1 + la)^4*(1
+ la)^2*(1 + la^2)*(1 + la + la^2)) ...
- (2*x.^12*(21 + 14*la + 14*la^2 + 8*la^3 +
3*la^4))/ ...
(((-1 + la)^5 *(1 + la)^2 *(1 + la^2)*(1 +
la + la^2)*(1 + la + la^2 + la^3 + la^4)) ...
+ (4*x.^14*(33 + 30*la + 37*la^2 + 32*la^3 +
27*la^4 + 12*la^5 + 8*la^6 + la^7))/ ...
((-1 + la)^6*(1 + la)^3*(1 + la + la^2)^2*(1 +
2*la^2 + la^3 + 2*la^4 + la^5 + 2*la^6 + la^8));

```

```

function x=ibfunc(la,y)
%
%      x=ibfunc(la,y)
%      --- Inverse Base function for the Logistic
Map
%
%      la inside [2,4]
%      y inside [0, la/4]

if y>la/4,
    disp('----ERROR: y is larger than lambda/4');
x=NaN; return; end
if y<0, disp('----ERROR: y is negative'); x=NaN;
return; end

Y=y;
NN=12;
for k=1:NN
    Y=(1 - sqrt(1 - 4*Y/la))/2;
end
X=sqrt((-1 + la - sqrt((1 + 4*Y -la)*(1-
la)))/2);
x=X*la^(NN/2);

```