Name _____

Topic 5 enVision STEM Project

Introduction to Nonlinear Functions BLM 1

Model an Insect Population, Part 1

The function below models a cicada population:

$f(x) = k \cdot f(x - 1) \cdot [1 - f(x - 1)]$, where $f(0) = 0.1$

and $f(1) = k(0.1) \cdot (1 - 0.1)$

The constant k, between 0 and 4, is the growth parameter that controls how quickly the population grows.

For each value of k below, find the point at which the population is stable. Explain how you know the population is stable.

$k = 2$	$k = 1$	$k = 1.5$

Topic 5 enVision STEM Project

Introduction to Nonlinear Functions BLM 2

Model an Insect Population, Part 2

The function below models a cicada population:

$f(x) = k \cdot f(x - 1) \cdot [1 - f(x - 1)]$, where $f(0) = 0.1$

and $f(1) = k(0.1) \cdot (1 - 0.1)$

What happens to the population for each value of k below? Explain your findings.

$k = 0.5$	$k = 3$	$k = 4$

Name _____

Topic 5 enVision STEM Project

Introduction to Nonlinear Functions BLM 3

Model an Insect Population, Part 3

The function below models a cicada population:

$f(x) = k \cdot f(x - 1) \cdot [1 - f(x - 1)]$, where $f(0) = 0.099$

and $f(1) = k(0.099) \cdot (1 - 0.099)$

What happens to the population for each value of k below? Explain your findings.

$k = 2$	$k = 1$	$k = 4$

Topic 5 enVision STEM Project

Introduction to Nonlinear Functions BLM 4

Analyze an Insect Population

What would be the best value of k for an insect population, and why?
What would happen if human interaction caused changes to the value of k (increases or decreases)?
Extension Why do you think k is limited to between 0 and 4?
Extension If the previous population is p, what do the terms p and $(1 - p)$ represent for determining the next population?
Extension Try to find values of $f(0)$ and k that reproduce the 17-year cicada's behavior.