HW 23

a. Species decreasing at a rate 5x its current value
b. Value at a given generation is 1/3 value at previous generation
c. Value at given generation is 5x the previous generation
d. Maximum possible for a species is 10, decreasing at a rate that is twice its current value.

a. i. Continuous
ii $x'(t) = -5x(t)$
iii $f(x) = -5x$
iv. $x = 0$
v. $f'(0) = -5$, stable at $\{0\}$

b. i. Discrete
ii $x(n) = \frac{1}{3}x(n-1)$
iii $f(x) = \frac{1}{3}x$
iv. when $x = f(x)$: $x = \frac{1}{3}x$
$x = 0$
v. $f'(0) = \frac{1}{3}$, stable at $\{0\}$

c. i. Discrete
ii. $x(n) = 5x(n-1)(1-x(n-1))$
iii. $f(x) = 5x(1-x)$
iv. $x - 5x(1-x) = 0$
$x = 0, \frac{1}{5}$
v. ~~$f(0) =$~~
$f(x) = 5x^2 - 5x$
$f'(0) = 5$; $x = 0$ is unstable
$f'(\frac{1}{5}) = -3$; $x = \frac{1}{5}$ is unstable

d. i. Continuous
ii. $x'(t) = 2x(t)(10 - x(t))$
iii. $f(x) = 2x(10-x)$
iv. $x = 0, 10$, $\{0, 10\}$
v. ~~$f(x) =$~~
$f'(0) = 20$, unstable.
$f'(10) = -60$, unstable