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HW 23

1. a. I thought you had to solve for the equation out of the differential

$$x'(t) = -3x(t)$$

$$f(x) = -3x$$

$$0 = -3x$$

$$0 = x$$

$$f'(x) = -3 \text{ stable}$$

$$x'(t) = 5x(t)$$

$$f(x) = 5x$$

$$0 = 5x$$

$$x = 0$$

$$f'(x) = 5 \text{ unstable}$$

b. Ran out of time so did not calculate stability

$$x(n) = 2x(n-1)$$

$$z = 2z$$

$$0 = z$$

$$f'(x) = 2 \text{ unstable}$$

$$x(n) = -\frac{1}{3}x(n-1)$$

$$z = -\frac{1}{3}z$$

$$0 = -\frac{4}{3}z$$

$$z = 0$$

$$f'(x) = -\frac{1}{3} \text{ stable}$$

c. Ran out of time so did not calculate stability

$$x(n) = 3x(n-1)(2 - x(n-1))$$

$$z = 3z(2 - z)$$

$$z = 6z - 3z^2$$

$$0 = 5z - 3z^2$$

$$0 = z(5 - 3z)$$

$$z = 0, \frac{5}{3}$$

$$f(x) = 6x - 3x^2$$

$$f'(x) = 6 - 2x$$

$$|f'(0)| = 6 \text{ not stable}$$

$$|f'(\frac{5}{3})| = 4.81 \text{ not stable}$$

$$x(n) = 4x(n-1)(1 - 3x(n-1))$$

$$z = 4z(1 - 3z)$$

$$z = 4z - 12z^2$$

$$0 = 3z - 12z^2$$

$$0 = 3z(1 - 4z)$$

$$z = 0, 4$$

$$f(x) = 4x - 12x^2$$

$$f'(x) = 4 - 24x$$

$$|f'(0)| = |4| \text{ not stable}$$

$$|f'(4)| = |-92| \text{ not stable}$$

d. Ran out of time so only wrote the transformations

$$x'(x) = 3x(x)(1 - 2x(x))$$

$$f(x) = 3x(1 - 2x)$$

$$0 = 3x(1 - 2x)$$

$$x = 0, \frac{1}{2}$$

$$f(x) = 3x - 6x^2$$

$$f'(x) = 3 - 12x$$

$$f'(0) = 3 \text{ unstable}$$

$$f'(\frac{1}{2}) = -3 \text{ stable}$$

$$x'(x) = 4x(x)(3 - 8x(x))$$

$$f(x) = 4x(3 - 8x)$$

$$0 = 4x(3 - 8x)$$

$$x = 0, \frac{3}{8}$$

$$f(x) = 12x - 32x^2$$

$$f'(x) = 12 - 64x$$

$$f'(0) = 12 \text{ unstable}$$

$$f'(\frac{3}{8}) = -12 \text{ stable}$$