

Attendance Quiz 23 - Alan Ho

a) i) continuous time

ii) $\frac{dx}{dt} = -2x$

iii) $x' = -2x$

iv) $x=0$

v) $f'(0) = 0$

Not stable

b) i) discrete time

ii) $x(n) = \frac{x(n-1)}{2}$

iii) ~~$f(z) = \frac{z}{2}$~~ $f(z) = \frac{z}{2}$

iv) $z = \frac{z}{2} \Rightarrow z=0$

v) $f'(0) = \frac{1}{2} < 1$

Stable

c) i) discrete

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

$$iii) f(z) = 2z(1-z) \Rightarrow$$

$$iv) z = 2z(1-z) \Rightarrow 2z - 2z^2$$

$$\frac{1}{2} = 1 - z \quad \boxed{z = \frac{1}{2}}$$

$$v) f'(z) = 2 - 4z$$

$$f'(\frac{1}{2}) = 0 \quad \boxed{\text{stable}}$$

d) i) continuous

$$ii) \frac{dx}{dt} = 1 - 2x(1-x)$$

$$iii) x' = 2x(1-x) \quad x = 1 - 2x(1-x)$$

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

$$\boxed{x = \frac{1}{2}}$$

$$x + 2x - 2x^2 = 1$$

$$-2x^2 + 3x - 1 = 0$$

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

$$v) f'(\frac{1}{2}) = 1 - 1 + \frac{1}{2} = \frac{1}{2} \quad \boxed{\text{not stable}}$$

$$f'(1) = 1 \quad \boxed{\text{not stable}}$$