

## Attendance Quiz 23

1) A (i) continuous time model

(ii)  $x'(t) = -2x(t)$

(iii)  $\frac{dx}{dt} = -2x = F(x)$

(iv)  $0 = -2x$  To find all equilibrium points, you set  
 $x=0$   $\frac{dx}{dt} = 0$  and solve for  $x$

(v)  $F'(x) = -2$

Since  $F'(0) < 0$ ,  $x=0$  is stable

$F'(0) = -2 < 0$

B (i) discrete time

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

(iii)  $f(x) = \frac{1}{2}x$

(iv)  $x = \frac{1}{2}x$

set  $f(x) = x$  to find fixed points

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

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

$x = 0$

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

$x=0$  is stable b/c  $f'(0) < 1$

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

C (i) discrete time model

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

(iii)  $f(x) = 2x$

(iv)  $x = 2x$  Set  $f(x) = x$  to find fixed points

$$x - 2x = 0$$

$$-x = 0$$

$$x = 0$$

(v)  $f'(x) = 2$   $x = 0$  is unstable because  $f'(x) > 1$

$$f'(0) = 2 > 1$$

D (i) continuous time model

(ii)  $x'(t) = 2(x(t) - 1)$

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

(iv)  $0 = 2(x-1)$  set  $F(x) = 0$  to find equilibrium points

$$\boxed{x=1}$$

(v)  $F'(x) = 2$   $x=1$  is unstable b/c  $F'(0) > 0$ .

$$F'(0) = 2 > 0$$