Q.3a: the steady state occurs when $x_{t+1} = x_t$ essentially

what we find $x = mx + c$

$x - mx = c$

$x(1-m) = c$

$x = \frac{c}{1-m}$

we find if $m=1$ $\frac{c}{1-1}$ is undefined
So cannot exist

Q.3c we will calculate the taylor series expansion to the first derivative to essentially linearize the function

$P(x) = f(x_0) + f'(x_0)(x - x_0)$ $x_0 = x^*$

$P(x) = f(x^*) + f'(x^*)x - f'(x^*)(x^*)$

we are left with $f'(x^*) = m$ from the previous question $f(x^*) - f'(x^*)x^* = c$

We know from L that if $m < 1$ it will locally converge so if $f'(x^*) < 1$ it will be locally stable