

Name _____

1. (4 points) The dynamical system shown has a stable equilibrium point at $(p^*, q^*) = (100, 75)$. Given that $p(0) = 15$ and $q(0) = 20$, determine the eventual rate at which p approaches equilibrium. Show all calculations you made to find the rate.

$$p(t) = 0.7p(t-1) + 0.2q(t-1) + 15$$

$$q(t) = 0.1p(t-1) + 0.6q(t-1) + 20$$

2. (6 points) For the following discrete dynamical systems,

- Find an explicit formula for the given function.
- Determine the equilibrium value, or state that no equilibrium value exists.
- For systems with an equilibrium value, state whether the equilibrium value is stable or unstable.
- For systems with an equilibrium value, determine the rate at which the function approaches or moves away from equilibrium.

(a) $q(t + 1) = q(t) - 3$ and $q(0) = 60$

(b) $u(n) = 1.1u(n - 1)$ and $u(0) = 40$

(c) $P(t) = 0.92P(t - 1) + 16$ and $P(0) = 25$