Solution of SDE1 problem 1

(a) $P_0 = 100,\ P_1 = 300,\ P_2 = 900,\ P_3 = 2700,\ P_4 = 8100,\ P_5 = 24300$

(b) (i)$P^+ = 3P$

(ii) $\Delta P = 2P$

(c) There is not enough information to determine f and d individually, but, since $f - d + 1 = \lambda = 3$, we can say that the difference between f and d is 2: $f - d = 2$.

Solution of SDE1 problem 2

(a) $P^+ = 2P$, time unit is 1/2 hour, and $P_0 = 1$.

(b) We need to compute to $t = 10$ (10 half-hours). Clearly the solution is $P = 2^t P_0$, so there are 1024 cells after 5 hours.

Solution of SDE1 problem 5

(a) $k > 1$

(b) $r > 0$

(c) $0 \leq k < 1$

(d) $-1 \leq r < 0$

See next page for SDE2 problems

Solution of SDE2 problem 2

(a):

(i) $\Delta P = 2P(1 - P/10)$

(ii) $\Delta P = 2P - .2P^2$

(iii) $\Delta P = .2P(10 - P)$

(iv) $P^+ = 3P - .2P^2t$

(b):

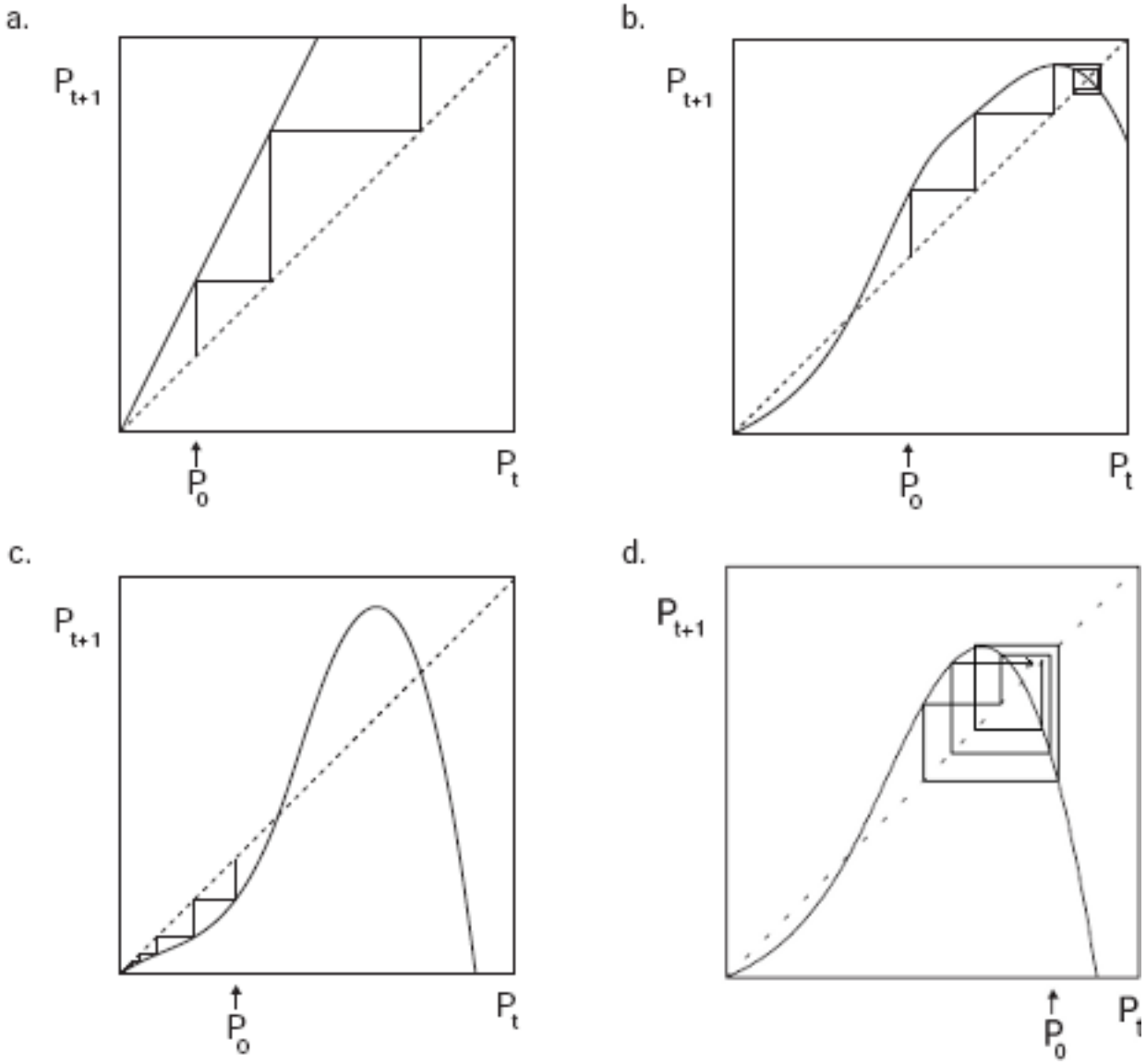
(i) $\Delta P = 1.5P(1 - P/(7.5))$

(ii) $\Delta P = 1.5P - .2P^2$

(iii) $\Delta P = .2P(7.5 - P)$

(iv) $P^+ = 2.5P - .2P^2$

Solution of SDE2 problem 5



Solution of SDE3 problem 1

(a) $P^* = 0, 15$

(b) $P^* = 0, 44$

(c) $P^* = 0, 20$

(d) $P^* = 0, \alpha/\beta$

(e) $P^* = 0, (\varepsilon - 1)/\delta$

Solution of SDE3 problem 2

(a) At $P^* = 0$, the linearization is $F' \approx 1.3$. Since $|1.3| > 1$, $P^* = 0$ is unstable.

At $P^* = 15$, the linearization is $F' \approx .7$. Since $|.7| < 1$, $P^* = 15$ is stable.

(b) $P^* = 0$ is unstable since $|3.2| > 1$; $P^* = 44$ is unstable since $|-1.2| > 1$.

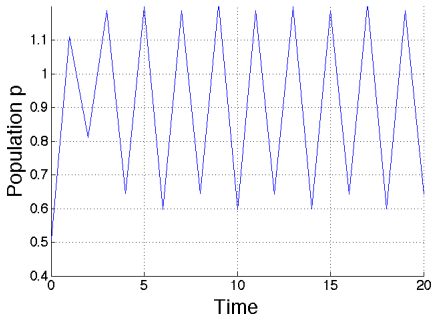
(c) $P^* = 0$ is unstable since $|1.2| > 1$; $P^* = 20$ is stable since $|.8| < 1$.

(d) $P^* = 0$ is stable if $|1 + \alpha| < 1$ (i.e., $-2 < \alpha < 0$) and unstable if $|1 + \alpha| > 1$ (i.e., $\alpha < -2$ or $\alpha > 0$);

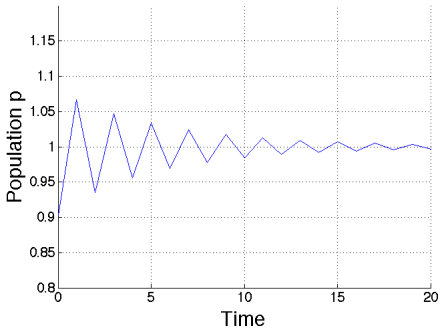
$P^* = \alpha/\beta$ is stable if $|1 - \alpha| < 1$ (i.e., $0 < \alpha < 2$) and unstable if $|1 - \alpha| > 1$ (i.e., $\alpha < 0$ or $\alpha > 2$).

(e) $P^* = 0$ is stable if $|\varepsilon| < 1$ and unstable if $|\varepsilon| > 1$; $P^* = (\varepsilon - 1)/\delta$ is stable if $|2 - \varepsilon| < 1$ (i.e., $1 < \varepsilon < 3$) and unstable if $|2 - \varepsilon| > 1$ (i.e., $\varepsilon < 1$ or $\varepsilon > 3$).

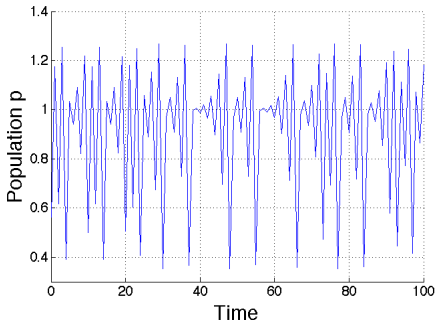
Solution of SDE4 problem 1



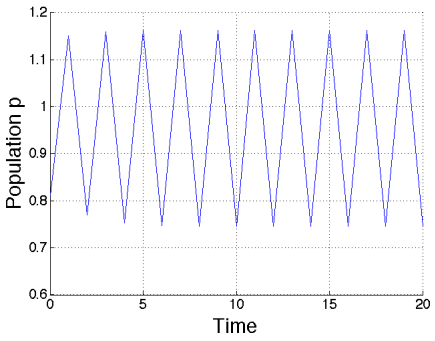
2.45



1.85



2.7



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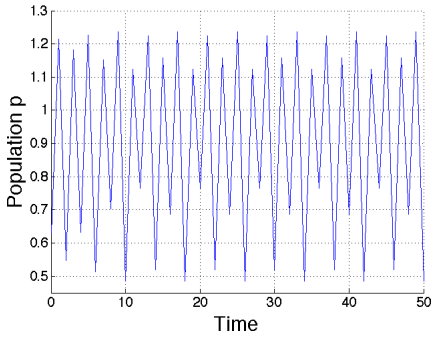
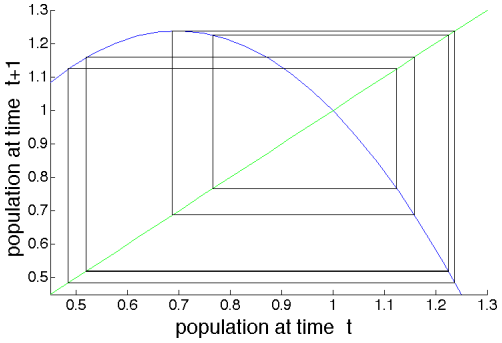
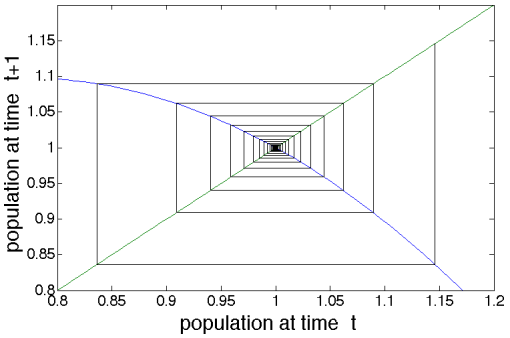


2.56

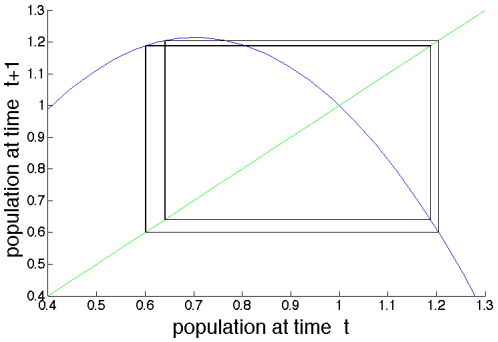
Solution of SDE4 problem 2



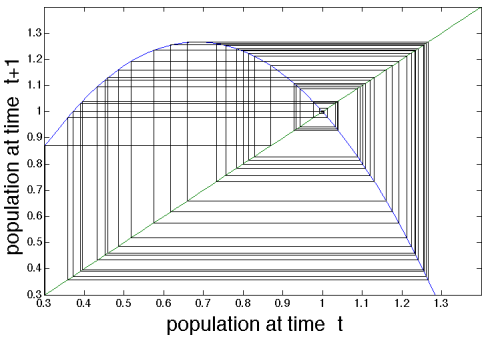
2.56



1.85



2.45



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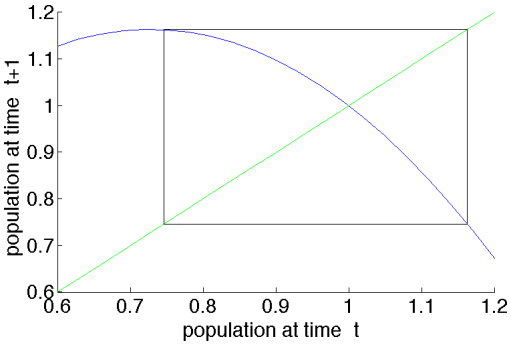

2.2