Section 1.5 – 1,2,4,8,10,12,16,28,29,30,32

1. a). Town (i) has the largest percent growth rate, at 12%.
    b). Town (ii) has the largest initial population, at 1000.
    c). Yes, town (iv) is decreasing in size, since the decay factor is 0.9, which is less than 1.

2. In each of these cases recall that if
   
   \[ A = A_0(a)^t \]

   then the initial amount is \( A_0 \) and if the growth factor \( a > 1 \) we have exponential growth otherwise we have decay.

4. (a) II    (b) I    (c) III    (d) IV

8. This problem is similar to our in-class example. You want to find an equation of the form \( P(x) = P_0a^x \). The points (0,3) and (2,18) are on the graph so

   \[ 3 = P_0a^0 \quad \text{and} \quad 8 = P_0a^2 \]

   now solve for \( a \) and \( P_0 \) You should get \( a = \frac{2}{3} \) and \( P_0 = 18 \).

10. a). \( G = 685.4(1.02)^t \)
    b). \( G = 685.4 + 7t \)

12. (a) 80 − 4t    (b) 80(0.95)^t

16. \( CPI = 234(1.018)^t \)

28. (a) \( a = 1.265, P_0 = 790.569 \)    (b) The initial quantity is growing at a rate of 26.5%.

29. The population is assumed to be exponential so \( P(t) = P_0e^{kt} \) assuming \( t \) is the time since 1998 so \( P_0 = 5.937 \), use the other data point \( P(16) = 7.238 \) to solve for \( k \), you should get \( k = 0.0124 \) so \( P(t) = P_0e^{0.00124t} \). Use that to find the population in 2015 and compare to the estimate provided.

30. 1.7%. Here we are looking for annual percentage increase therefore we want to find a function of the form \( P = P_0a^t \) such that \( P(0) = 190,205 \) and \( P(5) = 174,989 \). You should get \( P(t) = 190,205(0.932)^t \) corresponding to a annual decrease of 1.7%.

32. (a) 486 zebra mussels per year    (b) 18% per year.

Section 1.6 – 2,18,21-24,33,35,36,40,41

2. \( t = 1.209 \)

18. \( t \approx 0.9163 \)

21. Initial quantity is 5 and growth rate is 7%.

22. Initial quantity is 7.7 and growth rate is −8%.
23. Initial quantity is 15 and growth rate is \(-6\%\) (continuous decay)

24. Initial quantity is 3.2 and growth rate is 3\% (continuous)

33. (a) \(a = 0.168\) and \(P_0 = 84.575\)  (b) \(P_0\) is the initial amount flowing at a continuous rate of 16\%.

35. (a) Continuous percentage growth rate is 6\%  \(k = -0.916, P_0 = 1560.684\)  (b) Initial quantity is 1560.684 decaying at a continuous rate of 91.6\%.

36. (a) annual decay rate is 12\%  (b) \(P = 25e^{-0.128t}\).

40. \(f(t) = 84e^{-0.091t}\), \(f(17) = 18.882\) million barrels per day

41. (a) (i) \(P = 1000(1.05)^t\) (ii) \(P = 1000e^{0.05t}\)  (b) (i) 1629 (ii) 1649