

Section 5.5 (page 430)

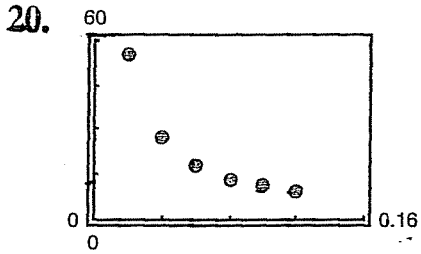
Vocabulary Check (page 430)

1. $y = ae^{bx}$; $y = ae^{-bx}$
2. $y = a + b \ln x$; $y = a + b \log x$
3. normally distributed
4. bell; average value
5. sigmoidal

1. c	2. e	3. b	4. a	5. d	6. f
<i>Initial Investment</i>	<i>Annual % Rate</i>	<i>Time to Double</i>	<i>Amount After 10 years</i>		
7. \$1000	3.5%	19.8 yr	\$1419.07		
8. \$750	10.5%	6.60 yr	\$2143.24		
9. \$750	8.9438%	7.75 yr	\$1834.33		
10. \$10,000	5.7762%	12 yr	\$17,817.93		
11. \$500	11.0%	6.3 yr	\$1505.00		
12. \$600	34.66%	2 yr	\$19,205.00		
13. \$6376.28	4.5%	15.4 yr	\$10,000.00		
14. \$1637.46	2%	34.7 yr	\$2000.00		
15. \$112,087.09		16. \$4214.16			
17. (a) 6.642 years	(b) 6.330 years				
(c) 6.302 years	(d) 6.301 years				
18. (a) 6.94 years	(b) 6.63 years				
(c) 6.602 years	(d) 6.601 years				

19.

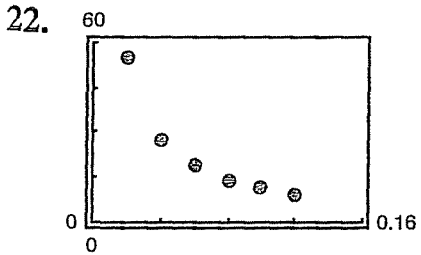
r	2%	4%	6%	8%	10%	12%
t	54.93	27.47	18.31	13.73	10.99	9.16



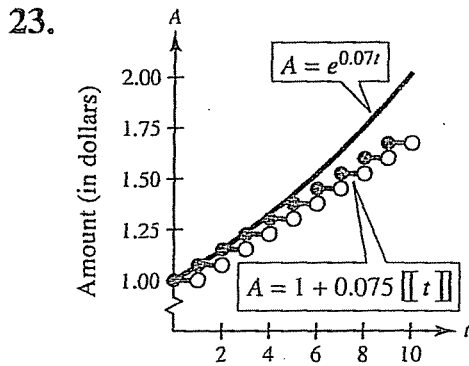
Use PwrReg: $t = 1.099r^{-1}$

21.

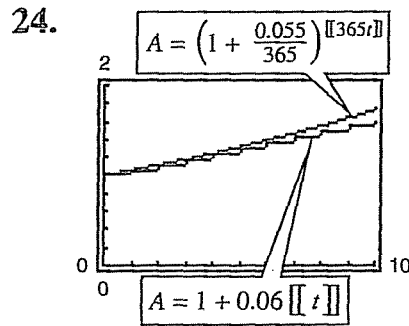
r	2%	4%	6%	8%	10%	12%
t	55.48	28.01	18.85	14.27	11.53	9.69



Use PwrReg: $t = 1.222r^{-1}$



Continuous compounding

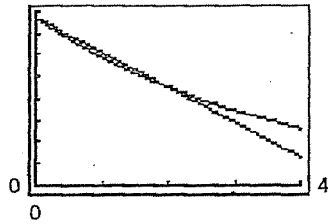


Daily compounding

- | <i>Half-life
(years)</i> | <i>Initial
Quantity</i> | <i>Amount After
1000 Years</i> |
|------------------------------|-----------------------------|------------------------------------|
| 25. 1599 | 10 g | 6.48 g |
| 26. 1599 | 2.31 g | 1.5 g |
| 27. 5715 | 2.26 g | 2 g |
| 28. 5715 | 3 g | 2.66 g |
| 29. 24,100 | 2.16 g | 2.1 g |
| 30. 24,100 | 0.41 g | 0.4 g |
31. $y = e^{0.7675x}$ 32. $y = \frac{1}{2}e^{0.5756x}$
33. $y = 5e^{-0.4024x}$ 34. $y = e^{-0.4621x}$
35. (a) Decreasing due to the negative exponent.
 (b) 2000: population of 2430 thousand
 2003: population of 2408.95 thousand
 (c) 2018
36. (a) Bulgaria: $y = 7.8e^{-0.00940t}$; 5.9 million
 Canada: $y = 31.3e^{0.00915t}$; 41.2 million
 China: $y = 1268.9e^{0.00602t}$; 1520.1 million
 United Kingdom: $y = 59.5e^{0.00282t}$; 64.8 million
 United States: $y = 282.3e^{0.00910t}$; 370.9 million
 (b) b ; The greater the rate of growth, the greater the value of b .
 (c) b determines whether the population is increasing ($b > 0$) or decreasing ($b < 0$).
37. $k = 0.2988$; $\approx 5,309,734$ hits
38. $k = 0.1337$; \$144.98 million 39. 3.15 hours
40. 61.16 hours
41. (a) $\approx 12,180$ years old (b) ≈ 4797 years old
42. 15,642 years

43. (a) $V = -6394t + 30,788$ (b) $V = 30,788e^{-0.268t}$

(c) 32,000



The exponential model depreciates faster.

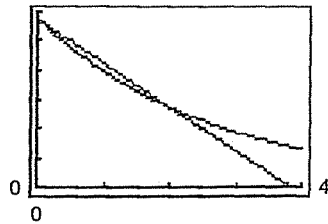
(d)

t	1	3
$V = -6394t + 30,788$	24,394	11,606
$V = 30,788e^{-0.268t}$	23,550	13,779

(e) Answers will vary.

44. (a) $V = -300t + 1150$ (b) $V = 1150e^{-0.368799t}$

(c) 1200



The exponential model depreciates faster.

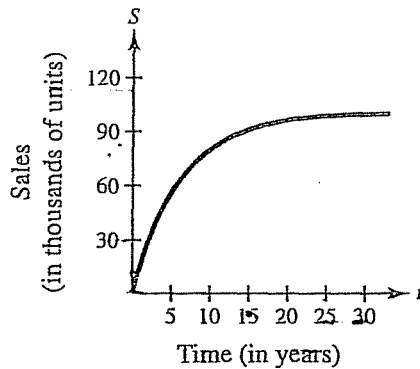
(d)

t	1 year	3 years
$V = -300t + 1150$	850	250
$V = 1150e^{-0.368799t}$	795	380

(e) Answers will vary.

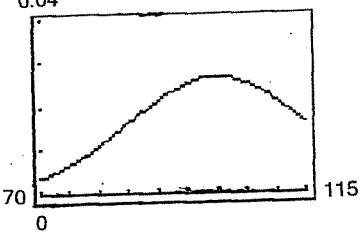
45. (a) $S(t) = 100(1 - e^{-0.1625t})$

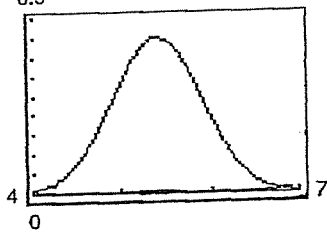
(b)



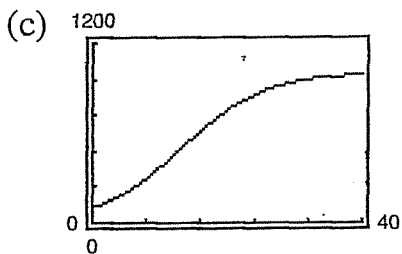
(c) 55,625

46. (a) $N = 30(1 - e^{-0.050t})$ (b) 36 days

47. (a)  (b) 100

48. (a)  (b) 5.4 hours per week

49. (a) 203 animals (b) 13 years



Horizontal asymptotes: $y = 0$, $y = 1000$. The population size will approach 1000 as time increases.

50. (a) $S = \frac{500,000}{1 + 0.6e^{0.026t}}$ (b) 287,567 units sold

51. (a) $10^{7.9} \approx 79,432,823$ (b) $10^{8.3} \approx 199,526,231$
 (c) $10^{4.2} \approx 15,849$

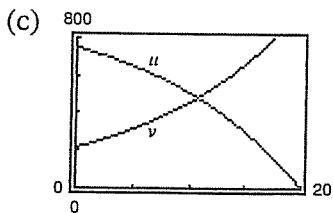
52. (a) 7.91 (b) 7.68 (c) 5.40

53. (a) 20 decibels (b) 70 decibels
 (c) 40 decibels (d) 120 decibels

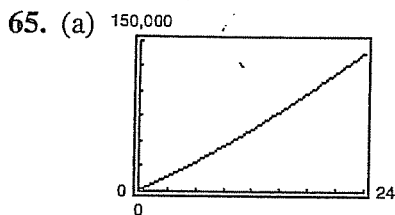
54. (a) 10 decibels (b) 140 decibels
 (c) 80 decibels (d) 100 decibels

55. 95% 56. 97% 57. 4.64 58. 4.95
 59. 1.58×10^{-6} moles per liter
 60. $10^{-3.2} \approx 6.3 \times 10^{-4}$ moles per liter 61. $10^{5.1}$
 62. 10 63. 3:00 A.M.

64. (a)  (b) Interest; $t \approx 26$ years

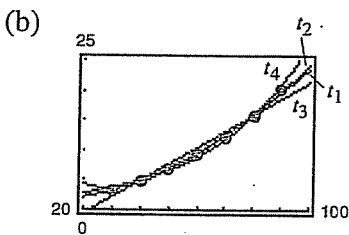


Interest; $t \approx 11$ years; The interest is still the majority of the monthly payment in the early years, but now the principal and interest are nearly equal when $t \approx 11$ years.



(b) ≈ 21 years; Yes

66. (a) $t_3 = 0.2729s - 6.0143$
 $t_4 = 1.5385e^{0.02913s}$ or $t_4 = 1.5385(1.0296)^s$



(c)

s	30	40	50	60	70	80	90
t_1	3.6	4.6	6.7	9.4	12.5	15.9	19.6
t_2	3.3	4.9	7.0	9.5	12.5	15.9	19.9
t_3	2.2	4.9	7.6	10.4	13.1	15.8	18.5
t_4	3.7	4.9	6.6	8.8	11.8	15.8	21.2

- (d) Model t_1 : Sum = 2.0
 Model t_2 : Sum = 1.1
 Model t_3 : Sum = 5.6
 Model t_4 : Sum = 2.7