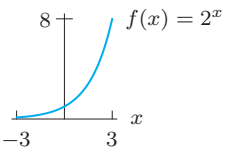
69 (a)




(b) 0.69
(c) 1.10
(d) $e \approx 2.72$

71 $V = 12{,}000e^{0.042t}$

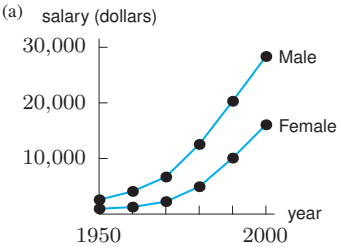
73 $y = -13.1x + 2090$

75 $a = 12{,}000$; $k = -12.2\%$; $b = 0.8851$; $r = -11.49\%$

77 (a) $15.269(1.122)^t$
(b) 108,066
(c) Not useful

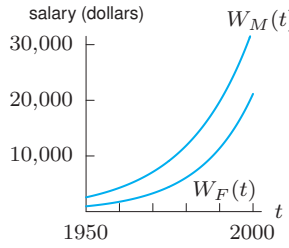
79 $t_0$ decreases

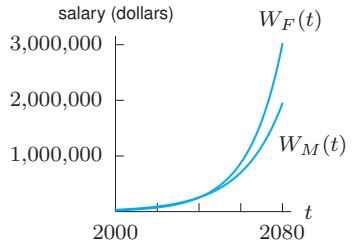
81 (a)




(b) $W_F(t) = 953e^{0.062(t-1950)}$ (women)
$W_M(t) = 2570e^{0.051(t-1950)}$ (men)

(c)




(d) Yes, in about 2060
(e) Not reliable

83 50.7%

## Ch. 4 Understanding

1 True
3 True
5 False
7 True
9 True
11 False
13 False
15 True
17 True
19 False
21 True
23 False
25 True
27 False
29 True
31 False

## Ch. 4 Tools: Exponents

1 25
3 10,000
5 5
7 1
9 4
11 4
13 16
15 $-121$
17 2100
19 2
21 32
23 100,000
25 $-6$
27 4
29 $1/(3\sqrt{3})$
31 $1/625$
33 0.5
35 $y^4$
37 $x^{5/2}y^2$
39 $5x^{3/2}z^2$
41 $r^{3/2}$
43 $8s^{7/2}$
45 $4\sqrt{3}u^5v^6y^{5/2}$
47 $16S^2xt^2$
49 $A^3/\left(3B^3\right)$
51 $(M+2)^2$
53 $3a$
55 $25(2b+1)^{20}$
57 $-8$
59 Not a real number
61 $1/512$
63 Not a real number
65 $x = \pm 1.690$
67 $(2.5, 31.25)$
69 False
71 True
73 True
75 $x = r + s$
77 $x = 5/a$
79 $x = 3/a$
81 $x = b/a$

## Section 5.1

S1 $x = 6$
S3 $z = 3/2$
S5 No solution
S7 $t = 14/9$
S9 $t = -1/8$
1 $19 = 10^{1.279}$
3 $26 = e^{3.258}$
5 $P = 10^t$
7 $8 = \log 100{,}000{,}000$
9 $v = \log \alpha$
11 (a) 3
(b) 1.5
(c) 0
(d) $1/2$
(e) 5
(f) 2
(g) $-1/2$
(h) 100
(i) 1
(j) 0.01
13 $(\log 11)/(\log 2) = 3.459$
15 $(\ln 100)/(0.12) = 38.376$
17 $(\log(48/17))/(\log(2.3)) = 1.246$
19 (a) $2x$
(b) $x^3$
(c) $-3x$
21 (a) 3, 3
(b) 5, 5
(c) $-1, -1$
(d) $-1, -1$
(e) 2, 2
(f) 3, 3
Both answers equal
23 (a) True
(b) False
(c) False
(d) True
(e) True
(f) False
25 $x = 57.002$
27 $x = (a - \log M)/(\log N)$
29 $x = 2.714$
31 (a) 10; 15%
(b) $t \approx 10.5$
(c) $t = (\ln 0.2)/(-0.15) = 10.730$
33 (a) $\log 15 - \log 5$
(b) $2 \log 5$
(c) $\log 15 + \log 5$
35 $(\log(91/46))/(\log(1.1))$
37 $(\ln 6/0.044)$
39 $x = \ln 10 - 4$
41 $\log(35/2)/\log(2/27)$
43 $t = \ln(500/400)/0.02$
45 $\ln 10 - 4$