Problem 2.

(a) (i) The cost of $3A$ pounds of apricots is $C(3A) = \frac{3}{A}(3A) = 9$ dollars.

(ii) The amount of apricots that can be purchased for \$6 is $C^{-1}(6) = \frac{A}{3}(6) = 2A$ pounds.

(iii) The amount of apricots that can be purchased for \$1 is $C^{-1}(1) = \frac{A}{3}(1) = \frac{A}{3}$ pounds.

(b) (i) True.

(ii) True.

(iii) True.

(iv) True.

(c) Statement iv.

Problem 4.

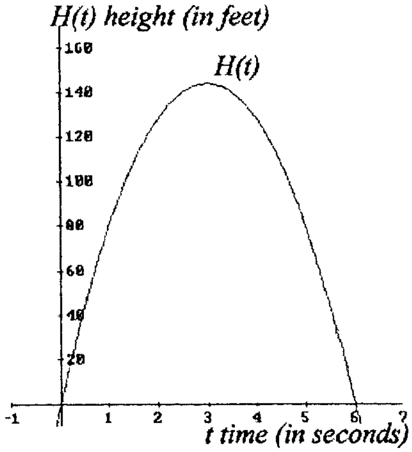
(a) To earn \$70 on a given day, the typist must type 50 words per minute.

(b) If the typist types five more words per minute today than he did yesterday, he will earn 10% more than he did yesterday.

(c) The will need to type $D^{-1}(B+10)$ words per minute to earn \$10 more today than he earned yesterday.

Problem 7.

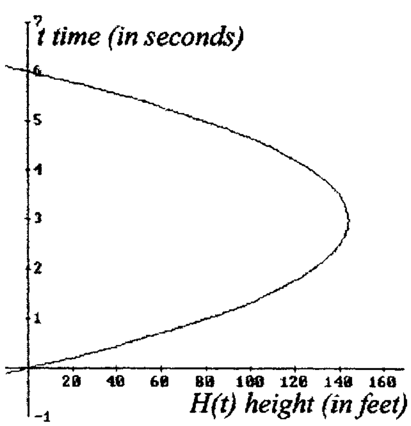
(a)



(b) Domain of H: $[0, 6]$. Note that values of t less than zero are meaningless because the ball not yet been thrown and that the values of t greater than 6 are meaningless because the ball hits the ground at $t = 6$ ($H(6) = 0$). Range of H: $[0, 144]$ (See explanation in part (c).)

(c) As H is a quadratic function with a negative lead coefficient, H will achieve its maximum value at the value of t for which $H'(t) = -32t + 96 = 0$. Thus H achieves its maximum value of $H(3) = 144$ at $t = 3$. Therefore the ball's maximum height is 144 feet, which is achieved 3 seconds after the ball is thrown.

(d) The inverse relation for $H(t)$ is not a function because its graph contains the points $(0, 0)$ and $(0, 6)$.

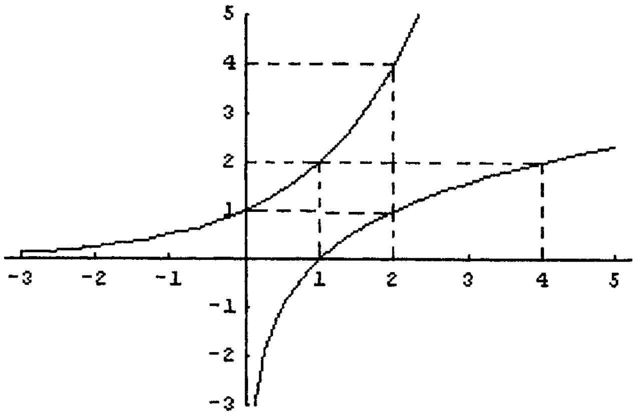


(e) Let domain be $[0, 3]$; the ball's fall is no longer represented.

(f) $H^{-1}(80) = 1$ because $H(1) = 80$. The ball reaches a height of 80 feet 1 second after it is thrown.

Section 13.1 The Logarithmic Function Defined

Problem 1.



Section 13.2 The Properties of Logarithms

Problem 1.

(a) $3^{\log_3 2} = 2$.

(b) $\log x + \log x^2 - 3\log x = \log x + 2\log x - 3\log x = 0$.

(c) $2\log(x+3) - 3\log(x+3) + \log(10^{\sqrt{7}}) = -\log(x+3) + \sqrt{7}$.

(d) $10^{\log x^2} = x^2$.

(e) $10^{3\log x} = 10^{\log x^3} = x^3$.

(f) $10^{-\log x} = 10^{\log x^{-1}} = x^{-1} = \frac{1}{x}$.

(g) $10^{-0.5\log x} = 10^{\log x^{-0.5}} = x^{-0.5} = \frac{1}{\sqrt{x}}$.

(h) $3^{-\log_3(x+y)} = 3^{\log_3(x+y)^{-1}} = (x+y)^{-1} = \frac{1}{x+y}$.

(i) $2^{(\log_2 10 - \log_2 5)} = 2^{(\log_2 \frac{10}{5})} = 2^{\log_2 2} = 2$.

(j) $10^{\frac{\log x}{2}} = (10^{\log x})^{\frac{1}{2}} = x^{\frac{1}{2}} = \sqrt{x}$.

Problem 5.

(a) $10^{\log 2+1} = 10^{\log 2}10^1 = 2(10) = 20$.

(b) $e^{3-\ln 2} = e^3 e^{-\ln 2} = e^3 e^{\ln 2^{-1}} = e^3(2^{-1}) = \frac{e^3}{2}$.

Problem 7.

(a) $10^{\log 2 - \log 3} = 10^{\log 2}10^{-\log 3} = 2(10^{\log 3^{-1}}) = 2(3^{-1}) = \frac{2}{3}$.

(b) $e^{2\ln 5 - \ln 2} = e^{2\ln 5}e^{-\ln 2} = e^{\ln 5^2}e^{\ln 2^{-1}} = (5^2)(2^{-1}) = \frac{25}{2}$.

Problem 9.

(a) $10^{\frac{\log 8+1}{2}} = (10^{\log 8+1})^{\frac{1}{2}} = \sqrt{10^{\log 8}10^1} = \sqrt{8(10)} = \sqrt{80} = 4\sqrt{5}$.

(b) $e^{-\frac{\ln 8}{3}+2} = e^{-\frac{\ln 8}{3}}e^2 = e^{-\frac{1}{3}\ln 8}e^2 = (e^{\ln 8})^{-\frac{1}{3}}e^2 = 8^{-\frac{1}{3}}e^2 = \frac{e^2}{\sqrt[3]{8}} = \frac{e^2}{2}$.

Problem 11.

$\frac{\log 12}{2} = \frac{1}{2}\log(2^2 3) = \frac{1}{2}(\log 2^2 + \log 3) = \frac{1}{2}(2\log 2 + \log 3) = \frac{1}{2}(2a+b) = a + \frac{b}{2}$.

Problem 13.

$\log(9\sqrt{2}) = \log 9 + \log\sqrt{2} = \log 3^2 + \log 2^{\frac{1}{2}} = 2\log 3 + \frac{1}{2}\log 2 = 2b + \frac{a}{2}$.

Problem 15.

$\ln\sqrt{x} - \frac{\ln x^3}{2} - 3\ln x = \ln\sqrt{x} - \ln(x^3)^{\frac{1}{2}} - \ln x^3 = \frac{1}{2}\ln x - \frac{3}{2}\ln x - 3\ln x = -4\ln x = \ln\left(\frac{1}{x^4}\right)$.

Problem 16.

$a\ln(x+3) - b\ln(\frac{1}{x}) - c\ln(x+1) = \ln(x+3)^a + \ln(\frac{1}{x})^{-b} + \ln(x+1)^{-c} = \ln(x+3)^a(\frac{1}{x})^{-b}(x+1)^{-c} =$
$\ln\frac{(x+3)^a x^b}{(x+1)^c}$.