Due 12/8/04

$\boxed{12.2}$

Problem 2.

(a) Given $y = 2 - \frac{x+1}{x}$, interchange x and y to obtain $x = 2 - \frac{y+1}{y} \Leftrightarrow xy = 2y - (y+1) \Leftrightarrow y = \frac{1}{1-x}$. Hence $f^{-1}(x) = \frac{1}{1-x}$.

(b) Given $y = \frac{x^5}{10} + 7$, interchange x and y to obtain $x = \frac{y^5}{10} + 7 \Leftrightarrow 10(x-7) = y^5 \Leftrightarrow y = \sqrt[5]{10x-70}$. Hence $f^{-1}(x) = \sqrt[5]{10x-70}$.

Problem 6.

Given $y = \frac{x}{x+3}$, interchange x and y and solve for y. Now $x = \frac{y}{y+3} \Rightarrow xy + 3x = y \Rightarrow y(1-x) = 3x \Rightarrow y = \frac{3x}{1-x}$. Hence $f^{-1}(x) = \frac{3x}{1-x}$. The domain of f^{-1} is $(-\infty, 1) \cup (1, \infty)$.

Problem 7.

Given $y = \frac{2}{3-x}$, interchange x and y and solve for y. Now $x = \frac{2}{3-y} \Rightarrow 3x - xy = 2 \Rightarrow yx = 3x - 2 \Rightarrow y = \frac{3x-2}{x}$. Hence $f^{-1}(x) = \frac{3x-2}{x} = 3 - \frac{2}{x}$. The domain of f^{-1} is $(-\infty, 0) \cup (0, \infty)$.

Problem 8.

Given $y = \sqrt{x+3}$, interchange x and y and solve for y. Now $x = \sqrt{y+3} \Rightarrow x^2 = y + 3 \Rightarrow y = x^2 - 3$. Hence $f^{-1}(x) = x^2 - 3$. The domain of f^{-1} is the range of f, which is $[0, \infty)$.

Problem 11.

$f(x) = x^3 + 2x - 3 \Rightarrow f'(x) = 3x^2 + 2$. As $f'(x) > 0$ for all x, f is increasing and hence 1-to-1. (Note: algebraically finding an inverse for f would require solving a cubic equation, which is not expected of students using this text.)

$\boxed{12.3}$

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.

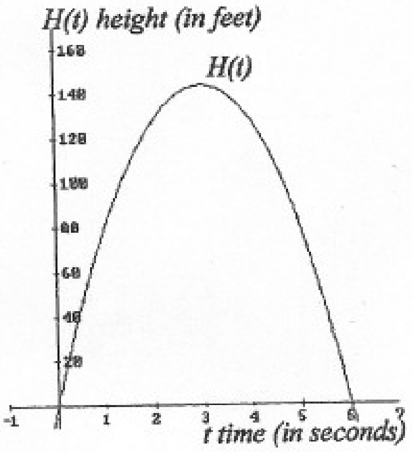
(a) To earn \$70 on a given day, the typist must type 50 words per minute.

(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.

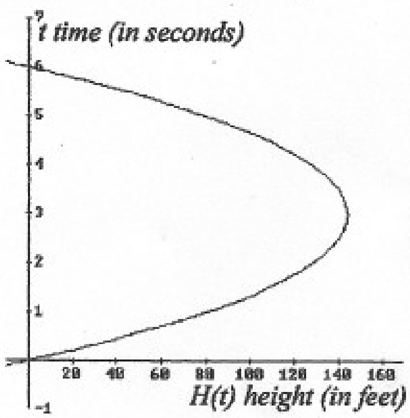
(a)



(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.

$\boxed{13.2}$

Problem 2.

(a) $\log_2(u^2w) = \log_2(u^2) + \log_2 w = 2\log_2 u + \log_2 w = 2A + B$

(b) $\log_2(u^3/w^2) = \log_2(u^3) - \log_2(w^2) = 3\log_2 u - 2\log_2 w = 3A - 2B$

(c) $\log_2(1/\sqrt{w}) = \log_2 1 - \log_2 \sqrt{w} = 0 - \log_2 w^{\frac{1}{2}} = -\frac{1}{2}\log_2 w = -\frac{1}{2}B$

(d) $\log_2(\frac{2}{\sqrt{uw}}) = \log_2 2 - \log_2(uw)^{\frac{1}{2}} = 1 - \frac{1}{2}(\log_2(uw)) = 1 - \frac{1}{2}(\log_2 u + \log_2 w) = 1 - \frac{1}{2}(A+B)$