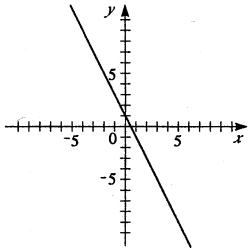
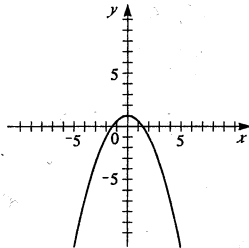


1.  $f(x) = x^2 - x + 1$ ;  $f(0) = (0)^2 - (0) + 1 = 1$ ;  $f(2) = (2)^2 - (2) + 1 = 3$ ;  
 $f(-2) = (-2)^2 - (-2) + 1 = 7$ ;  $f(a) = (a)^2 - (a) + 1 = a^2 - a + 1$ ;  
 $f(-a) = (-a)^2 - (-a) + 1 = a^2 + a + 1$ ;  
 $f(x+1) = (x+1)^2 - (x+1) + 1 = x^2 + 2x + 1 - x - 1 + 1 = x^2 + x + 1$ ;  
 $f(2x) = (2x)^2 - (2x) + 1 = 4x^2 - 2x + 1$ ;  
 $2f(x) - 2 = 2(x^2 - x + 1) - 2 = 2x^2 - 2x + 2 - 2 = 2x^2 - 2x$ .
3. (a)  $f(-2) = -1$ .  $f(2) = 2$ .
- (b) The domain of  $f$  is  $[-4, 5]$ .
- (c) The range of  $f$  is  $[-4, 4]$ .
- (d)  $f$  is increasing on  $[-4, -2]$  and  $[-1, 4]$ ;  $f$  is decreasing on  $[-2, -1]$  and  $[4, 5]$ .
- (e)  $f$  is not a one-to-one, for example,  $f(-2) = -1 = f(0)$ . There are many more examples.

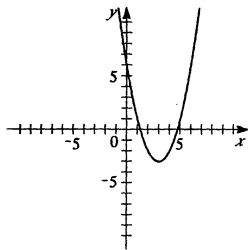
15.  $f(x) = 1 - 2x$



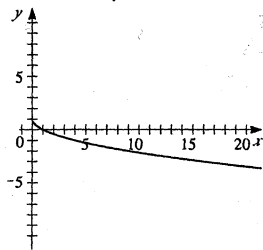
17.  $f(t) = 1 - \frac{1}{2}t^2$



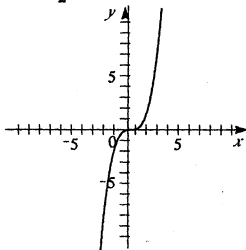
19.  $f(x) = x^2 - 6x + 6$



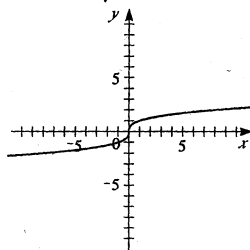
21.  $y = 1 - \sqrt{x}$



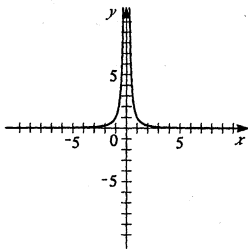
23.  $y = \frac{1}{2}x^3$



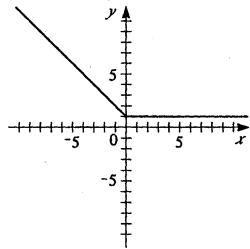
25.  $h(x) = \sqrt[3]{x}$



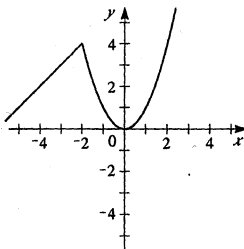
27.  $g(x) = \frac{1}{x^2}$



29.  $f(x) = \begin{cases} 1 - x & \text{if } x < 0 \\ 1 & \text{if } x \geq 0 \end{cases}$



31.  $f_4(x) = \begin{cases} x + 6 & \text{if } x < -2 \\ x^2 & \text{if } x \geq -2 \end{cases}$



65.  $f(x) = x^2 - 3x + 2$  and  $g(x) = 4 - 3x$ .

(a)  $(f + g)(x) = (x^2 - 3x + 2) + (4 - 3x) = x^2 - 6x + 6$

(b)  $(f - g)(x) = (x^2 - 3x + 2) - (4 - 3x) = x^2 - 2$

(c)  $(fg)(x) = (x^2 - 3x + 2)(4 - 3x) = 4x^2 - 12x + 8 - 3x^3 + 9x^2 - 6x$   
 $= -3x^3 + 13x^2 - 18x + 8$

(d)  $\left(\frac{f}{g}\right)(x) = \frac{x^2 - 3x + 2}{4 - 3x}, x \neq \frac{4}{3}$

(e)  $(f \circ g)(x) = f(4 - 3x) = (4 - 3x)^2 - 3(4 - 3x) + 2 = 16 - 24x + 9x^2 - 12 + 9x + 2$   
 $= 9x^2 - 15x + 6$

(f)  $(g \circ f)(x) = g(x^2 - 3x + 2) = 4 - 3(x^2 - 3x + 2) = -3x^2 + 9x - 2$

69.  $f(x) = \sqrt{1 - x}$ ,  $g(x) = 1 - x^2$  and  $h(x) = 1 + \sqrt{x}$ .

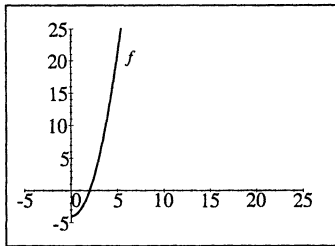
$$(f \circ g \circ h)(x) = f(g(h(x))) = f(g(1 + \sqrt{x})) = f(1 - (1 + \sqrt{x})^2) = f(1 - (1 + 2\sqrt{x} + x)) = f(-x - 2\sqrt{x}) = \sqrt{1 - (-x - 2\sqrt{x})} = \sqrt{1 + 2\sqrt{x} + x} = \sqrt{(1 + \sqrt{x})^2} = 1 + \sqrt{x}$$

77.  $f(x) = 3x - 2 \Leftrightarrow y = 3x - 2 \Leftrightarrow 3x = y + 2 \Leftrightarrow x = \frac{1}{3}(y + 2)$ . So  
 $f^{-1}(x) = \frac{1}{3}(x + 2)$ .

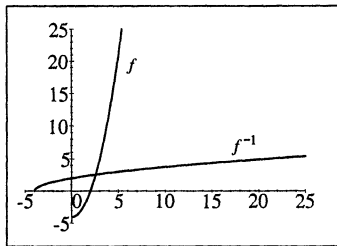
79.  $f(x) = (x + 1)^3 \Leftrightarrow y = (x + 1)^3 \Leftrightarrow x + 1 = \sqrt[3]{y} \Leftrightarrow x = -1 + \sqrt[3]{y}$ . So  
 $f^{-1}(x) = -1 + \sqrt[3]{x}$ .

81.  $f(x) = x^2 - 4, x \geq 0$ .

(a)



(b)



(c)  $f(x) = x^2 - 4, x \geq 0 \Leftrightarrow y = x^2 - 4, y \geq -4 \Leftrightarrow x^2 = y + 4 \Leftrightarrow x = \sqrt{y + 4}$ .  
 So  $f^{-1}(x) = \sqrt{x + 4}, x \geq -4$ .