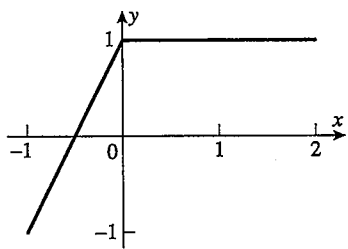
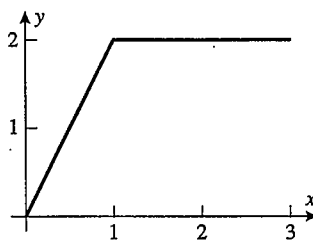


**EXERCISE SET 1.3**

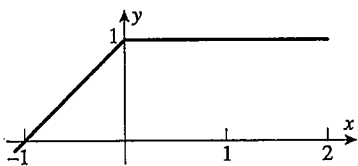
1. (a)



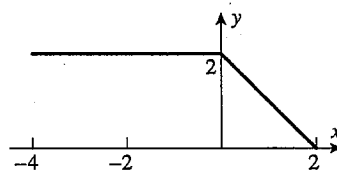
(b)



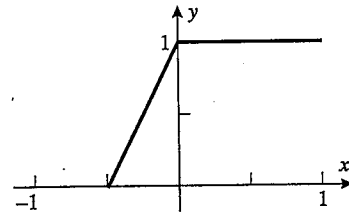
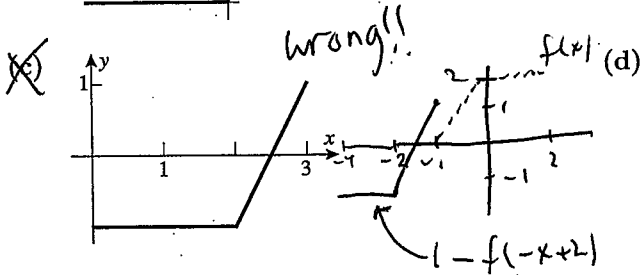
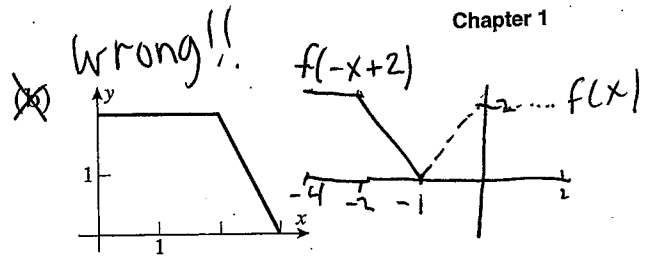
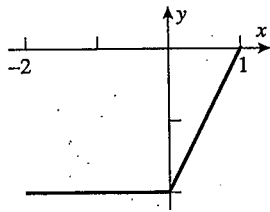
(c)



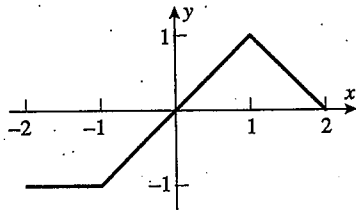
(d)



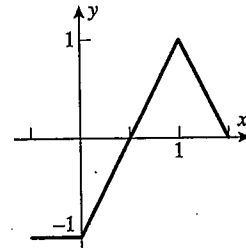
2. (a)



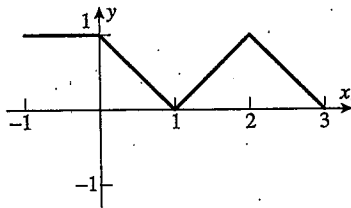
3. (a)



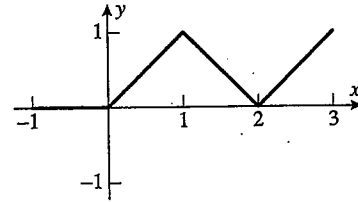
(b)



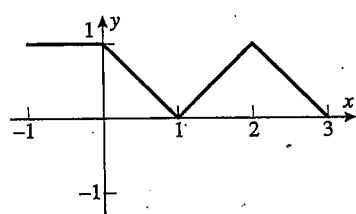
(c)



(d)

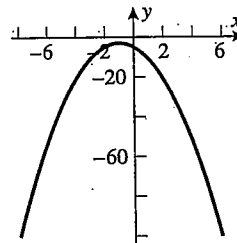


4.

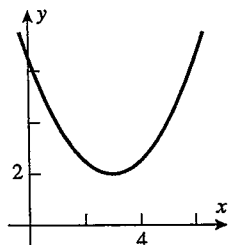


5.

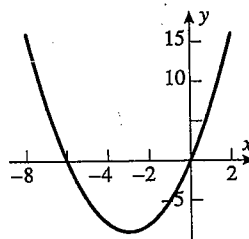
Translate left 1 unit, stretch vertically by a factor of 2, reflect over  $x$ -axis, translate down 3 units.



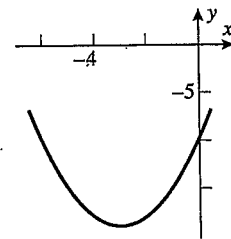
6. Translate right 3 units, compress vertically by a factor of  $\frac{1}{2}$ , and translate up 2 units.



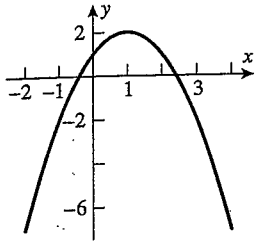
7.  $y = (x + 3)^2 - 9$ ; translate left 3 units and down 9 units.



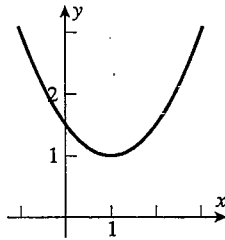
8.  $y = (x + 3)^2 - 19$ ; translate left 3 units and down 19 units.



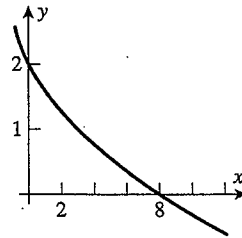
9.  $y = -(x - 1)^2 + 2$ ;  
translate right 1 unit,  
reflect over  $x$ -axis,  
translate up 2 units.



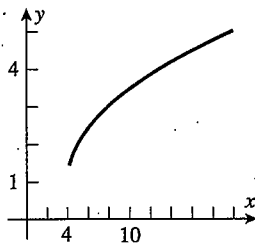
10.  $y = \frac{1}{2}[(x - 1)^2 + 2]$ ;  
translate right 1 unit  
and up 2 units,  
compress vertically  
by a factor of  $\frac{1}{2}$ .



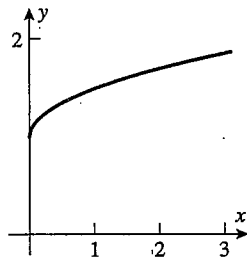
11. Translate left 1 unit,  
reflect over  $x$ -axis,  
translate up 3 units.



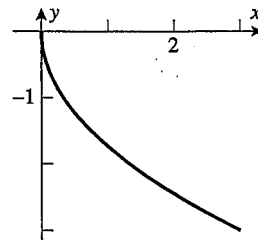
12. Translate right 4 units  
and up 1 unit.



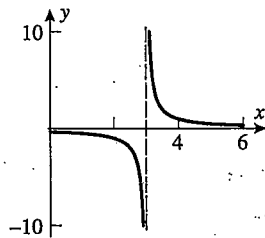
13. Compress vertically  
by a factor of  $\frac{1}{2}$ ,  
translate up 1 unit.



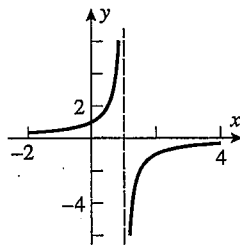
14. Stretch vertically by  
a factor of  $\sqrt{3}$  and  
reflect over  $x$ -axis.



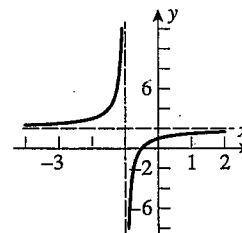
15. Translate right 3 units.



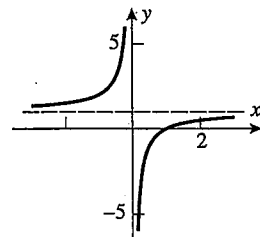
16. Translate right 1 unit  
and reflect over  $x$ -axis.



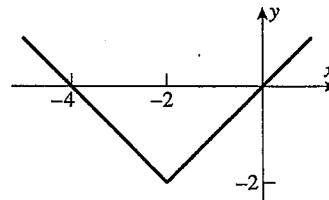
17. Translate left 1 unit,  
reflect over  $x$ -axis,  
translate up 2 units.



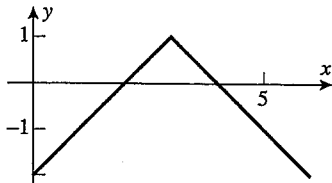
18.  $y = 1 - 1/x$ ;  
reflect over  $x$ -axis,  
translate up 1 unit.



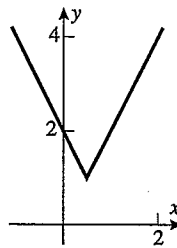
19. Translate left 2 units  
and down 2 units.



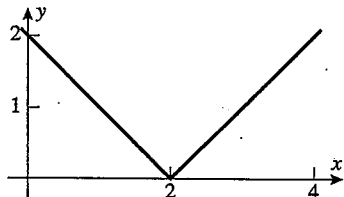
20. Translate right 3 units, reflect over  $x$ -axis, translate up 1 unit.



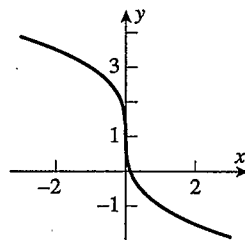
21. Stretch vertically by a factor of 2, translate right  $1/2$  unit and up 1 unit.



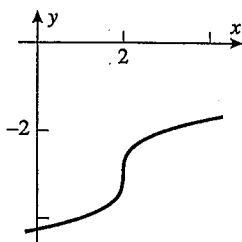
22.  $y = |x - 2|$ ; translate right 2 units.



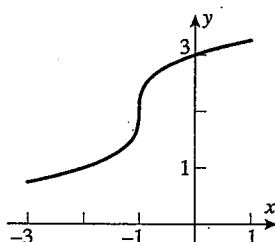
23. Stretch vertically by a factor of 2, reflect over  $x$ -axis, translate up 1 unit.



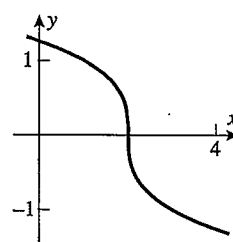
24. Translate right 2 units and down 3 units.



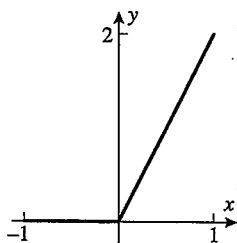
25. Translate left 1 unit and up 2 units.



26. Translate right 2 units, reflect over  $x$ -axis.

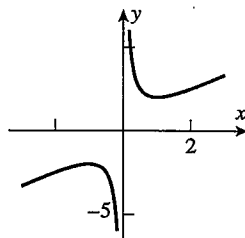


27. (a)



(b)  $y = \begin{cases} 0 & \text{if } x \leq 0 \\ 2x & \text{if } 0 < x \end{cases}$

- 28.



29.  $(f + g)(x) = 3\sqrt{x - 1}$ ,  $x \geq 1$ ;  $(f - g)(x) = \sqrt{x - 1}$ ,  $x \geq 1$ ;  $(fg)(x) = 2x - 2$ ,  $x \geq 1$ ;  
 $(f/g)(x) = 2$ ,  $x > 1$

30.  $(f + g)(x) = (2x^2 + 1)/[x(x^2 + 1)]$ , all  $x \neq 0$ ;  $(f - g)(x) = -1/[x(x^2 + 1)]$ , all  $x \neq 0$ ;  $(fg)(x) = 1/(x^2 + 1)$ , all  $x \neq 0$ ;  $(f/g)(x) = x^2/(x^2 + 1)$ , all  $x \neq 0$

31. (a) 3 (b) 9 (c) 2 (d) 2

32. (a)  $\pi - 1$  (b) 0 (c)  $-\pi^2 + 3\pi - 1$  (d) 1

33. (a)  $t^4 + 1$  (b)  $t^2 + 4t + 5$  (c)  $x^2 + 4x + 5$  (d)  $\frac{1}{x^2} + 1$   
 (e)  $x^2 + 2xh + h^2 + 1$  (f)  $x^2 + 1$  (g)  $x + 1$  (h)  $9x^2 + 1$

34. (a)  $\sqrt{5s+2}$  (b)  $\sqrt{\sqrt{x}+2}$  (c)  $3\sqrt{5x}$  (d)  $1/\sqrt{x}$   
 (e)  $\sqrt[4]{x}$  (f) 0 (g)  $1/\sqrt[4]{x}$  (h)  $|x-1|$

35.  $(f \circ g)(x) = 1 - x, x \leq 1; (g \circ f)(x) = \sqrt{1-x^2}, |x| \leq 1$

36.  $(f \circ g)(x) = \sqrt{\sqrt{x^2+3}-3}, |x| \geq \sqrt{6}; (g \circ f)(x) = \sqrt{x}, x \geq 3$

37.  $(f \circ g)(x) = \frac{1}{1-2x}, x \neq \frac{1}{2}, 1; (g \circ f)(x) = -\frac{1}{2x} - \frac{1}{2}, x \neq 0, 1$

38.  $(f \circ g)(x) = \frac{x}{x^2+1}, x \neq 0; (g \circ f)(x) = \frac{1}{x} + x, x \neq 0$

39.  $x^{-6} + 1$

40.  $\frac{x}{x+1}$

41. (a)  $g(x) = \sqrt{x}, h(x) = x + 2$

(b)  $g(x) = |x|, h(x) = x^2 - 3x + 5$

42. (a)  $g(x) = x + 1, h(x) = x^2$

(b)  $g(x) = 1/x, h(x) = x - 3$

43. (a)  $g(x) = x^2, h(x) = \sin x$

(b)  $g(x) = 3/x, h(x) = 5 + \cos x$

44. (a)  $g(x) = 3 \sin x, h(x) = x^2$

(b)  $g(x) = 3x^2 + 4x, h(x) = \sin x$

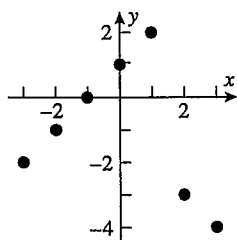
45. (a)  $f(x) = x^3, g(x) = 1 + \sin x, h(x) = x^2$

(b)  $f(x) = \sqrt{x}, g(x) = 1 - x, h(x) = \sqrt[3]{x}$

46. (a)  $f(x) = 1/x, g(x) = 1 - x, h(x) = x^2$

(b)  $f(x) = |x|, g(x) = 5 + x, h(x) = 2x$

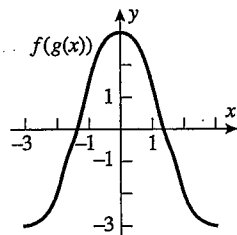
47.



48.  $\{-2, -1, 0, 1, 2, 3\}$

49. Note that

$f(g(-x)) = f(-g(x)) = f(g(x)),$   
 so  $f(g(x))$  is even.



50. Note that  $g(f(-x)) = g(f(x)),$   
 so  $g(f(x))$  is even.

