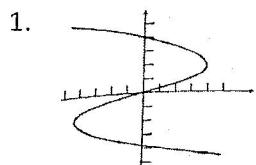
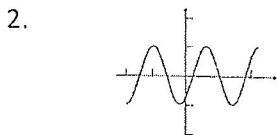


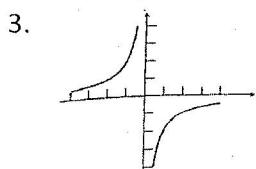
For #1-4, the graph of a relation is shown. (A) Is the relation a function? (B) Does the relation have an inverse that is a function?



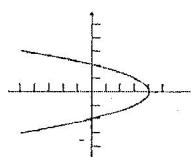
no ; yes



yes ; no



yes ; yes



no ; yes

For #5-9, find  $f^{-1}(x)$ . Give the domain of  $f^{-1}$ , including any restrictions “inherited” from  $f$ .

5.  $f(x) = 3x - 6$        $f^{-1}(x) = \frac{1}{3}x + 2$        $(-\infty, \infty)$

6.  $f(x) = \frac{2x - 3}{x + 1}$        $f^{-1}(x) = \frac{x + 3}{2 - x}$        $(-\infty, 2) \cup (2, \infty)$

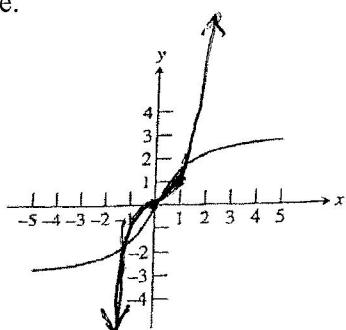
7.  $f(x) = \sqrt{x - 3}$        $f^{-1}(x) = x^2 + 3$        $[0, \infty)$

8.  $f(x) = x^3$        $f^{-1}(x) = \sqrt[3]{x}$        $(-\infty, \infty)$

9.  $f(x) = \sqrt[3]{x + 5}$        $f^{-1}(x) = x^3 - 5$        $(-\infty, \infty)$

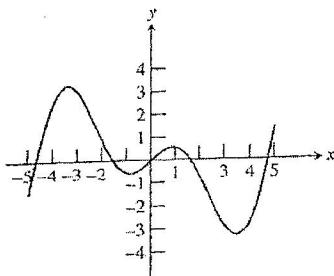
For #10-13, determine whether the function is one-to-one. If it one-to-one, sketch the graph of the inverse.

10.



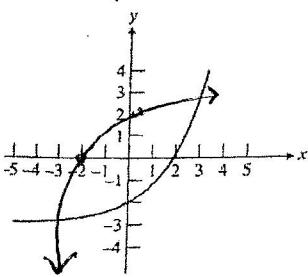
yes

11.



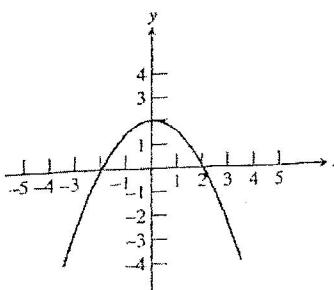
no

12.



yes

13.



no

For #14-16, confirm that  $f$  and  $g$  are inverses by showing that  $f(g(x)) = x$  and  $g(f(x)) = x$ .

14.  $f(x) = 3x - 2$  and  $g(x) = \frac{x+2}{3}$

$$f(g(x)) = 3\left(\frac{x+2}{3}\right) - 2 = x + 2 - 2 = x$$

$$g(f(x)) = \frac{3x - 2 + 2}{3} = \frac{3x}{3} = x$$

15.  $f(x) = x^3 + 1$  and  $g(x) = \sqrt[3]{x-1}$

$$f(g(x)) = (\sqrt[3]{x-1})^3 + 1 = x - 1 + 1 = x$$

$$g(f(x)) = \sqrt[3]{x^3 + 1 - 1} = \sqrt[3]{x^3} = x$$

16.  $f(x) = \frac{7}{x}$  and  $g(x) = \frac{7}{x}$

$$f(g(x)) = \frac{7}{\frac{7}{x}} = 7 \cdot \frac{x}{7} = x \quad g(f(x)) = \frac{7}{\frac{7}{x}} = 7 \cdot \frac{x}{7} = x$$

For #17-28, determine whether the function is one-to-one.

17.  $f(x) = 3x - 7$

yes

18.  $f(x) = \frac{1}{x-2}$

yes

19.  $f(x) = x^2 - 9$

no

20.  $f(x) = x^2 + 4$

no

21.  $f(x) = \sqrt{x}$

yes

22.  $f(x) = \sqrt[3]{x}$

yes

23.  $f(x) = |x|$

no

24.  $f(x) = 3$

no

25.  $f(x) = \sqrt{4-x^2}$

no

26.  $f(x) = 2x^3 - 4$

yes

27.  $f(x) = x^2 - 9$

no

28.  $f(x) = \frac{1}{x^2}$

no

For #29-31, find two functions defined implicitly by each given relation.

29.  $x^2 + y^2 = 25$

$$y = \sqrt{25-x^2}$$

$$y = -\sqrt{25-x^2}$$

30.  $3x^2 - y^2 = 25$

$$y = \sqrt{3x^2 - 25}$$

$$y = -\sqrt{3x^2 - 25}$$

31.  $3x^2 + 75y^2 = 27 - 30xy$

$$y = -\frac{1}{5}x + \frac{3}{5}$$

$$y = -\frac{1}{5}x - \frac{3}{5}$$