Name___Havel___

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the relation is a function.

1) $\{(-9, -7), (-9, 5), (1, 2), (5, -2), (10, -2)\}$

    A) Function   B) Not a function

1) ___B___

Determine whether the equation defines y as a function of x.

2) $x^2 + y^2 = 25$

    A) y is a function of x   B) y is not a function of x

2) ___B___

3) $y = -\sqrt{x + 1}$

    A) y is a function of x   B) y is not a function of x

3) ___A___

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Evaluate the function at the given value of the independent variable and simplify.

4) $f(x) = 3x^2 + 2x - 3;$ $f(x - 1)$

$$3(x-1)^2 + 2(x-1) - 3$$
$$3(x^2 - 2x + 1) + 2x - 2 - 3$$
$$3x^2 - 6x + 3 + 2x - 5$$
$$3x^2 - 4x - 2$$

4) $\underline{3x^2 - 4x - 2}$
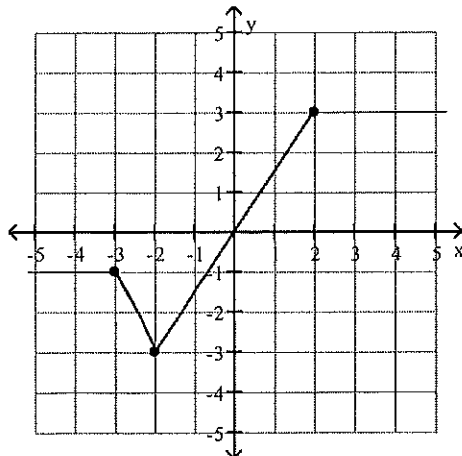
5) $f(x) = \dfrac{x^3 + 8}{x^2 - 8};$ $f(2)$

$$\frac{(2)^3 + 8}{(2)^2 - 8} = \frac{8 + 8}{4 - 8} = \frac{16}{-4} = -4$$

5) ___-4___

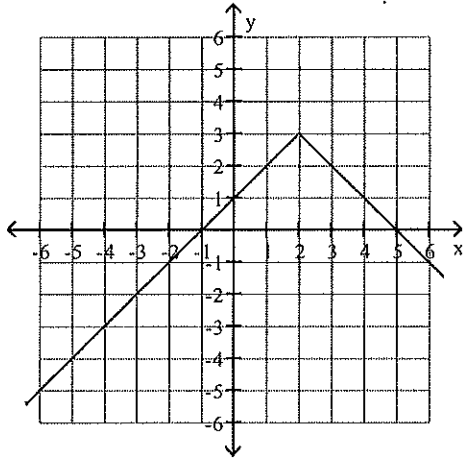Identify the intervals where the function is changing as requested.

6) Increasing

6) $\underline{(-2, 2)}$
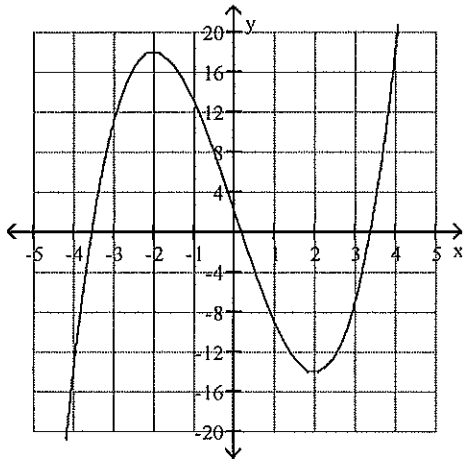
Use the graph to determine the function's domain and range.

7)

Use the graph of the given function to find the _point(s)_ of any relative maxima and relative minima.

8) $f(x) = x^3 - 12x + 2$

R max: $(-2, 18)$

R min: $(2, -14)$

8) _____

Determine whether the given function is even, odd, or neither.

9) $f(x) = 5x^2 + x^4$

$$5(-x)^2 + (-x)^4$$
$$5x^2 + x^4$$

9) __Even__

10) $f(x) = x^3 + x^2 + 1$

$$(-x)^3 + (-x)^2 + 1$$
$$-x^3 + x^2 + 1$$

10) __Neither__

Evaluate the piecewise function at the given value of the independent variable.

11) $f(x) = \begin{cases} x + 5 & \text{if } x > 1 \\ -(x + 5) & \text{if } x \leq 1 \end{cases}$; $f(-3)$
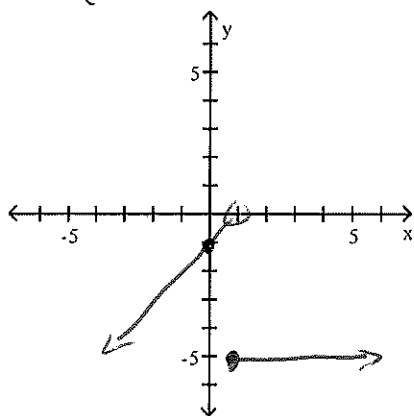
$-(-3 + 5)$

11) $\underline{\quad -2 \quad}$

12) $h(x) = \begin{cases} \dfrac{x^2 + 4}{x - 3} & \text{if } x \neq 3 \\ x - 1 & \text{if } x = 3 \end{cases}$; $h(3)$

$3 - 1 = 2$

12) $\underline{\quad 2 \quad}$

Graph the function.

13) $f(x) = \begin{cases} x - 1 & \text{if } x < 1 \\ -5 & \text{if } x \geq 1 \end{cases}$

13) $\underline{\qquad}$

Find and simplify the difference quotient $\dfrac{f(x + h) - f(x)}{h}$, $h \neq 0$ for the given function.

14) $f(x) = x^2 + 7x + 5$

14) $\underline{\quad 2x + h + 7 \quad}$

$f(x+h) = (x+h)^2 + 7(x+h) + 5$

$= x^2 + 2xh + h^2 + 7x + 7h + 5$

$\dfrac{f(x+h) - f(x)}{h} = \dfrac{\cancel{x^2} + 2xh + h^2 + \cancel{7x} + 7h + \cancel{5} - \cancel{x^2} - \cancel{7x} - \cancel{5}}{h}$

$= \dfrac{\cancel{h}(2x + h + 7)}{\cancel{h}}$

3

Use the given conditions to write an equation for the line in slope–intercept form.

15) Passing through (1, –4) with x–intercept = –1

$m = \dfrac{0+4}{-1-1} = \dfrac{4}{-2} = -2$ $(-1, 0)$

$y + 4 = -2(x - 1)$

$y + 4 = -2x + 2$

15) $\underline{y = -2x - 2}$

Use the given conditions to write an equation for the line in point–slope form.

16) Passing through (8, –7) and (–4, –1)

$m = \dfrac{-1+7}{-4-8} = \dfrac{6}{-12} = \dfrac{-1}{2}$

$\boxed{y + 7 = -\dfrac{1}{2}(x - 8) \text{ or } y + 1 = -\dfrac{1}{2}(x + 4)}$

16) _____

Given functions f and g, perform the indicated operations.

17) $f(x) = 3 - 3x, \qquad g(x) = -8x + 3$

Find f + g.

$3 - 3x - 8x + 3$

$-11x + 6$

17) $\underline{-11x + 6}$

18) $f(x) = 3x^2 - 8x, \quad g(x) = x^2 - 5x - 24$

Find $\dfrac{f}{g}$.

$\dfrac{3x^2 - 8x}{x^2 - 5x - 24} = \dfrac{x(3x - 8)}{(x - 8)(x + 3)}$

18) _____

For the given functions f and g , find the indicated composition.

19) $f(x) = 8x^2 - 5x, \quad g(x) = 12x - 9$

$(f \circ g)(11)$

$g(11) = 12(11) - 9 = 123$

$(f \circ g)(11) = 8(123)^2 - 5(123)$

19) $\underline{120,417}$

4

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find functions f and g so that h(x) = (f ∘ g)(x).

20) $h(x) = \dfrac{6}{\sqrt{2x + 9}}$

20) __D__

   A) $f(x) = \sqrt{2x + 9},\ g(x) = 6$

   B) $f(x) = 6/x,\ g(x) = 2x + 9$

   C) $f(x) = 6,\ g(x) = \sqrt{2 + 9}$

   D) $f(x) = 6/\sqrt{x},\ g(x) = 2x + 9$

Determine which two functions are inverses of each other.

21) $f(x) = \dfrac{x + 3}{2}$ $g(x) = 2x + 3$ $h(x) = \dfrac{x - 3}{2}$

21) __B__

   A) f(x) and h(x)   B) g(x) and h(x)   C) f(x) and g(x)   D) None

$x = \dfrac{y+3}{2}$

$2x = y + 3$

$y = 2x - 3$

$x = 2y + 3$

$\dfrac{x - 3}{2} = y$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the inverse of the one-to-one function.

22) $f(x) = \dfrac{7x + 8}{5}$

22) $\dfrac{5x - 8}{7}$

$x = \dfrac{7y + 8}{5}$
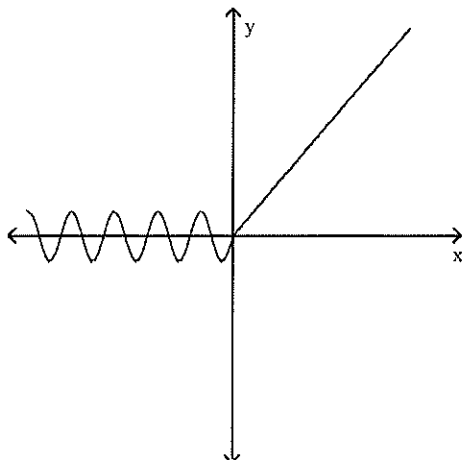
$5x = 7y + 8$

$7y = 5x - 8$

$y = \dfrac{5x - 8}{7}$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Does the graph represent a function that has an inverse function?

23)

23) __A__

inverse?
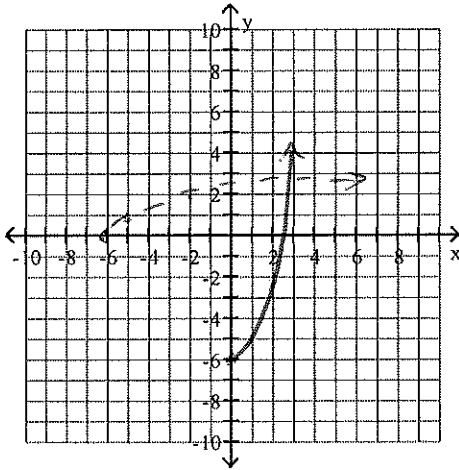Horizontal line test

   A) No   B) Yes

5

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Graph f^{-1} given f(x) in the rectangular coordinate space. Use interval notation to give the domain and range of f^{-1}.

24) $f(x) = x^2 - 6, x \geq 0$ 24) _____

$x = y^2 - 6$

$x + 6 = y^2$

$y = \sqrt{x + 6}$ $(-6, 0)$

For the given functions f and g , find the indicated composition.

25) $f(x) = 4x^2 + 2x + 8, \quad g(x) = 2x - 3$ 25) $\underline{8x^2 + 4x + 13}$
    $(g \circ f)(x)$

$2(4x^2 + 2x + 8) - 3$

$8x^2 + 4x + 16 - 3$

$8x^2 + 4x + 13$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

26) On a certain route, an airline carries 6000 passengers per month, each paying $100. A market   26) __D__
    survey indicates that for each $1 decrease in the ticket price, the airline will gain 40 passengers.
    a. Express the number of passengers per month, N, as a function of the ticket price, x.
    b. Express the monthly revenue for the route, R, as a function of the ticket price, x.

    A) a. $N(x) = 40x + 2000$ B) a. $N(x) = -40x + 2000$
       b. $R(x) = 40x^2 + 2000x$ b. $R(x) = -40x^2 + 2000x$
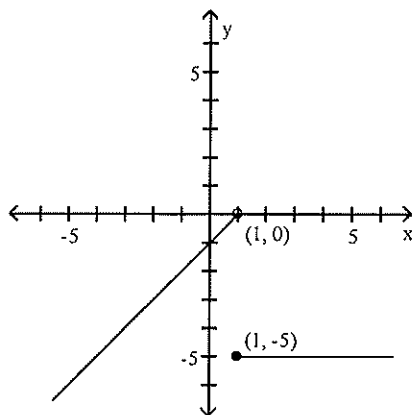   C) a. $N(x) = 40x + 10,000$ D) a. $N(x) = -40x + 10,000$
       b. $R(x) = 40x^2 + 10,000x$ b. $R(x) = -40x^2 + 10,000x$

1) B
2) B
3) A
4) $3x^2 - 4x - 2$
5) $- 4$
6) $(-2, 2)$
7) domain: $(-\infty, \infty)$
   range: $(-\infty, 3]$
8) minimum: $(2, -14)$; maximum: $(-2, 18)$
9) Even
10) Neither
11) -2
12) 2
13)
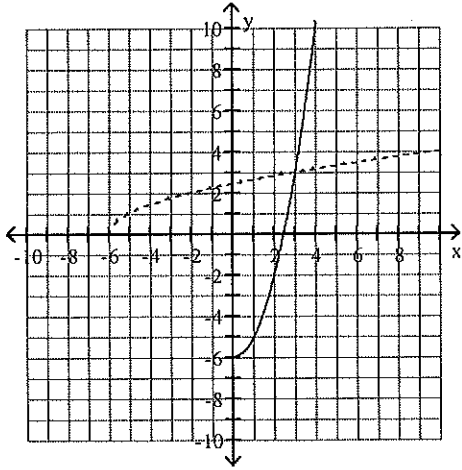

14) $2x + h + 7$
15) $y + 4 = - 2(x - 1)$ or $y = - 2(x + 1)$
16) $y = -\dfrac{1}{2}x - 3$
17) $-11x + 6$
18) $\dfrac{3x^2 - 8x}{x^2 - 5x - 24}$
19) 120,417
20) D
21) B
22) $f^{-1}(x) = \dfrac{5x - 8}{7}$
23) A

24)

f domain = $(0, \infty)$; range = $(-6, \infty)$

f^{-1} domain = $(-6, \infty)$; range = $(0, \infty)$

25) $8x^2 + 4x + 13$

26) D