1.2 Functions and Graphs

A. Relations, Functions, Domain and Range

Relation: any set of ordered pairs (*x, y*) is called a relation in *x* and *y*.
- ✓ Some relations are functions and some are not
- ✓ The <u>domain</u> is all the x values
- ✓ The <u>range</u> is all the y values
    - o Hint: "**d**" comes before "**r**" in the alphabet just like x comes before y so "**d**omain" goes with x and "**r**ange" goes with y.
    - o Sometimes we can make a list of all the x and y values and use this notation to identify the domain and range:
      D = { , , , } and R = { , , , }
    - o Sometimes we can't make a list of all the x and y values and we use interval notation.
        - ▪ For the domain, both numbers in the interval are from the x-axis.
        - ▪ For the range, both numbers in the interval are from the y-axis.
        - ▪ We use parenthesis (,) for the interval when the small or large numbers cannot be included. On a graph we see this as an open circle.
        - ▪ We use brackets [,] for the interval when the small or large numbers are included in the domain and range. On a graph we see this as a closed circle.
        - ▪ If the small number for the interval is -∞ or the large number for the interval is ∞ we always use (or) for the interval.

**Function:** a rule that assigns to each element, *x*, in a set A, exactly one element, *f(x)*, in a set B.
- ✓ This means a function CANNOT repeat any x-coordinates but CAN repeat y-coordinates.
- ✓ The Vertical Line Test can be used to determine if a graphed relation is a function. If a vertical line passes through the graph two or more times, the graph fails the vertical line test which means the relation is NOT a function.

Determine if the relation is a function. Then find the domain and range.

1. {(1, 2), (3, 4), (5, 6), (7, 8)}   2. {(2, n), (5, p), (1, 2), (5, m)}
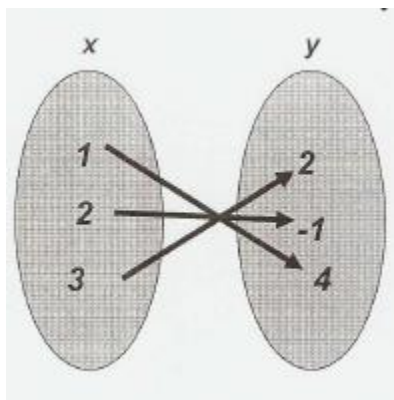
3. {(3, 2), (-1, 2), (-5, 4), (7, 8)}   4.
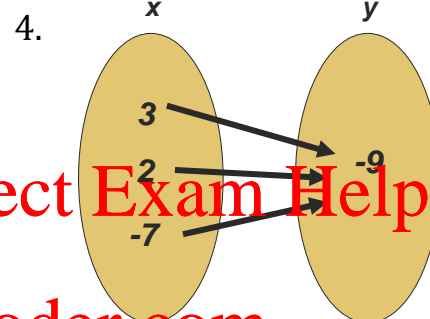
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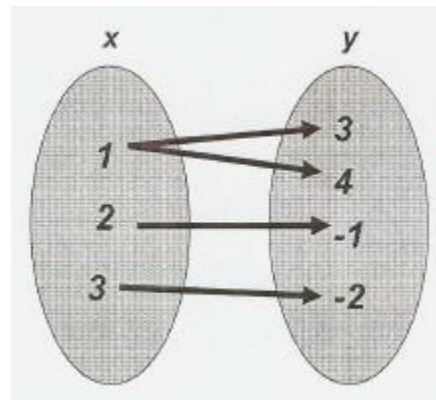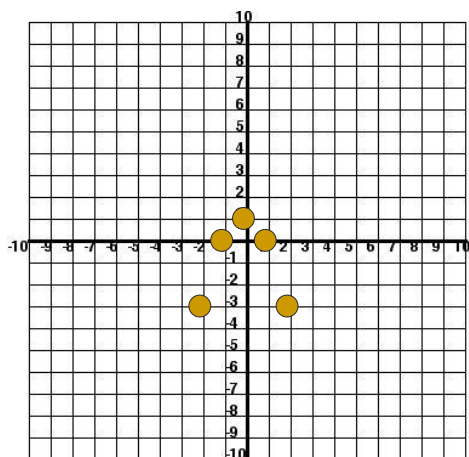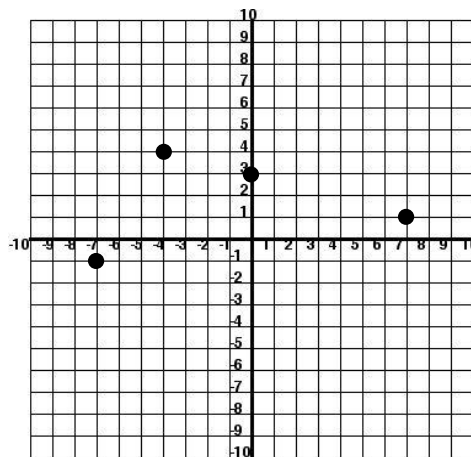
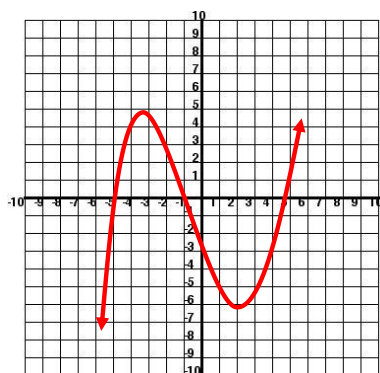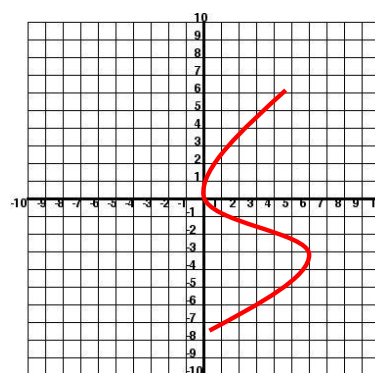Use the Vertical Line Test to determine if the relation is a function.

9.
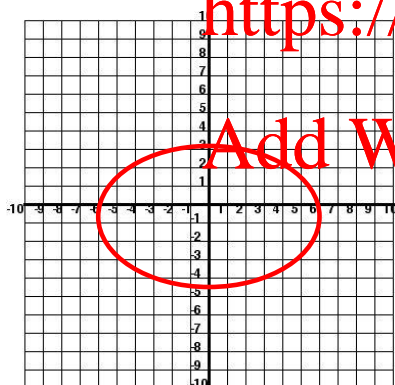
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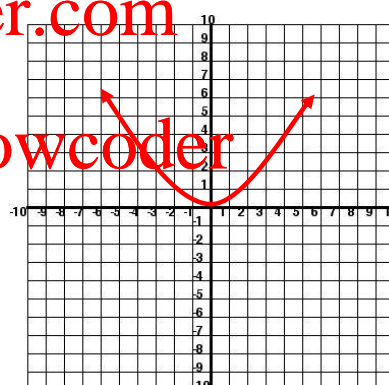
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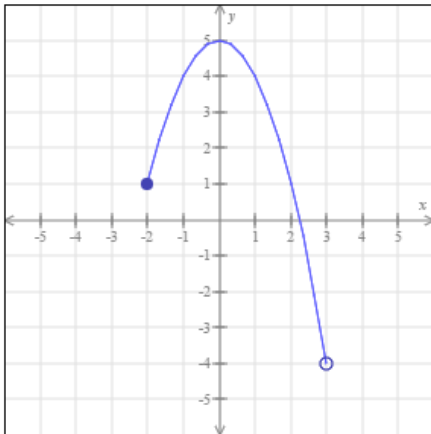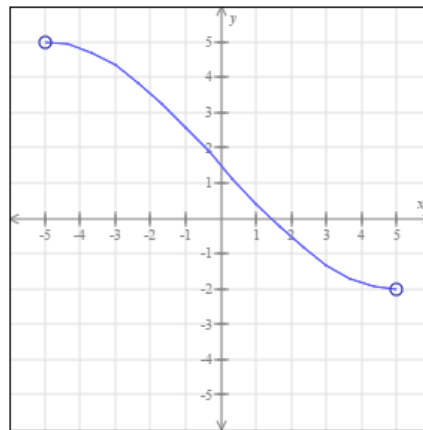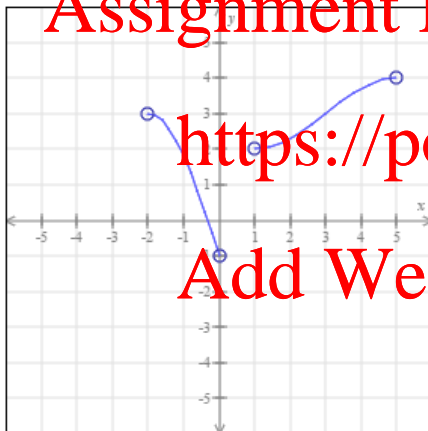

12.

Write the domain and range using interval notation.
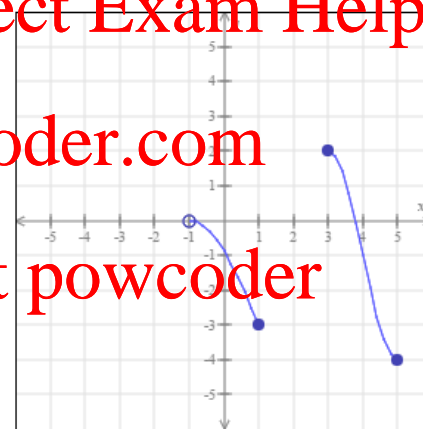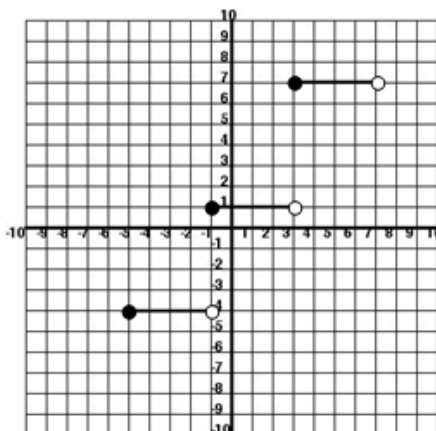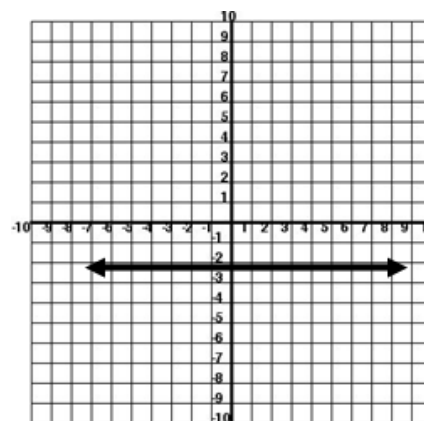
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B. Evaluating Functions

19. If $f(x) = -x^2 + 5$ find $f(-4)$

20. If $g(x) = -3x - 4$ find $g(2)$

21. If $h(x) = 2x^3 - 1$ find $h(-3)$

22. If $k(x) = \frac{x-4}{x^2-5x-36}$ find $k(-2)$

23. If $f(x) = 3x^2 - 5$ find $f(4n)$

24. If $h(x) = \frac{x+3}{2x+1}$ find $h(x + 1)$

25. If $f(x) = 3x^2 - 2x$ find $f(-x)$

26. If $g(x) = x - 3$ find $g(z + 5)$

C. Finding the domain of an equation

1) Is it a fraction?
   a. Find the excluded values. (Set the denominator equal to zero and solve for x.)
   b. Make a list of all the excluded values.
2) Is it an even index radical?
   a. Set the inside expression ≥ 0 and solve for x.
   b. Domain: $[\underline{\quad}, \infty)$ or it could be $(-\infty, \underline{\quad}]$

Find all the values of x that are NOT in the domain. If there is more than one value, separate them with commas.

27. $f(x) = \dfrac{2x+1}{x^2-9}$

28. $g(x) = \dfrac{x-5}{(x-9)(x+7)}$

Find the domain of the function. Write your answer using interval notation.
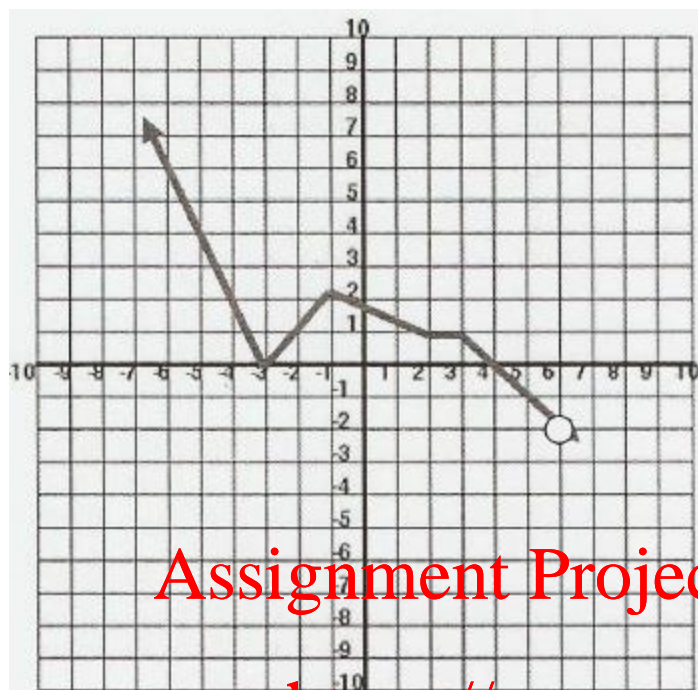
29. $f(x) = \sqrt{x+4}$

30. $g(x) = \sqrt{x} - 3$

31. $f(x) = \sqrt{3-4x}$

32. $g(x) = \sqrt{-x} - 8$

D. Finding inputs and outputs of a function from its graph.

33. The graph of a function, $f(x)$ is given. Find all information.

a. Find $f(-1)$
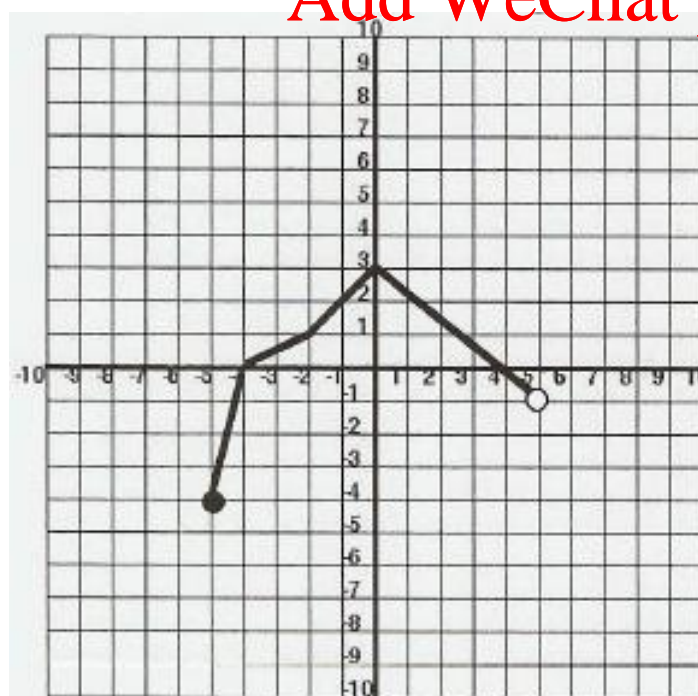
b. Find $f(2)$

c. Find $f(6)$

d. For what value of x is $f(x) = 3$?

e. For what value(s) of x is $f(x) = 0$?

34. The graph of a function, $h(x)$ is given. Find all information.

a. Find $h(0)$

b. Find $h(-2)$

c. Find $h(5)$

d. For what value(s) of x is $h(x) = 0$?

e. For what value of x is $h(x) = -4$?