COLLEGE ALGEBRA

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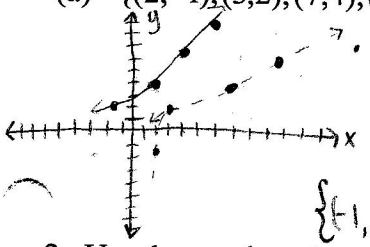
GPS # 21 — **2.7 INVERSE FUNCTIONS** — Class Time: 11:30-12:45 Date: Feb. 19, 09

Useful Guidelines:

* **One-to-one function:** A function whose inverse is also a function. [If $x_1 \neq x_2$, then $f(x_1) \neq f(x_2)$]
* Horizontal-line test: If every horizontal line intersects the graph of f in at most one point, then f is one-to-one.
* The graph of a function f and its inverse f^{-1} are symmetric with respect to the line $y = x$.
* To find the inverse, $f^{-1}(x)$, of a one-to-one function:
  (1) Let $y = f(x)$
  (2) Interchanging the variables x and y
  (3) Solve for y and replace y by $f^{-1}(x)$
  (4) Check the result by showing that $f^{-1}(f(x)) = x$ and $f(f^{-1}(x)) = x$
* To find the range of a one-to-one function f, find the domain of the inverse function f^{-1}.
  [Domain of f = Range of f^{-1}; Range of f = Domain of f^{-1}.]

1. Determine whether the given function is one-to-one. If it is one-to-one, find the inverse.
[Hint: Check to see if there are ordered pairs with different first coordinates and the same second coordinate. If there are, the function is not one-to-one. We can find its inverse by interchanging the x- and y-coordinates in each ordered pair.]

(a) $\{(2,-1),(3,2),(7,4),(9,6)\}$



• one-to-one function
inverse function:
$\{(-1,2)(2,3)(4,7)(6,9)\}$

(b) $\{(-2,4),(0,0),(2,4),(4,16)\}$
- Not a one to one function
- NO inverse function.

2. Use the graph to determine whether the function is one-to-one. [Hint: use Horizontal-line test]

(a) $f(x) = x^3$
one-to-one
It is a function, and can Have inverse function.
It is a one to one function

(b) $f(x) = x^2$
one-to-one
Not a function, can not Have inverse function.
Not a one to one function.

3. In the following problems, determine whether the function f is one-to-one. If it is, find the inverse of each function.

(a) $\sqrt{x-3}$
it is a function
domain: $[3, \infty)$
range: $[0, \infty)$

① $y = \sqrt{x-3}$
② $x = \sqrt{y-3}$
③ $x = \sqrt{y-3}$
$(x)^2 = (\sqrt{y-3})^2$
$x^2 = y - 3$
$y = x^2 + 3$
④ $f^{-1}(x) = x^2 + 3$

inverse domain: $[0, \infty)$
inverse range: $[3, \infty)$

So neat!

(b) $\frac{3}{x-2}$
domain: $\{x \mid x \neq 2\}$
range: $\{y \mid y \neq 0\}$

① $y = \frac{3}{x-2}$
② $\frac{x}{1} = \frac{3}{y-2} \rightarrow (y-2)\frac{x}{x} = \frac{3}{x}$
③ $y - 2 = \frac{3}{x}$
$y = \frac{3}{x} + 2$
④ $f^{-1}(x) = \frac{3}{x} + 2$

inverse domain: $\{x \mid x \neq 0\}$ inverse range: $\{y \mid y \neq 2\}$