*AAT

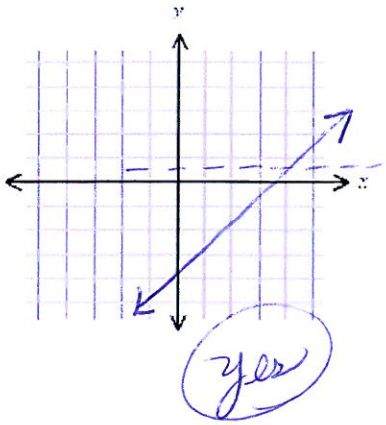
Name: Key

Chapter 3: 3-8 Inverse Functions (IC/HW)-Day 1

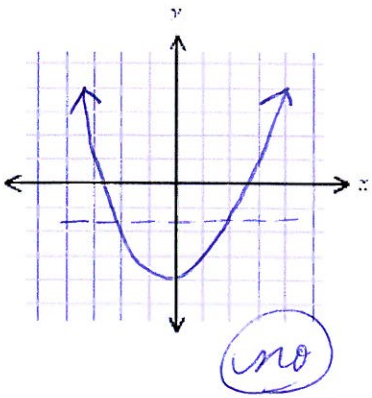
Date: / Period:

Determine whether the function f is one-to-one. (Hint: graph and use the horizontal line test.)

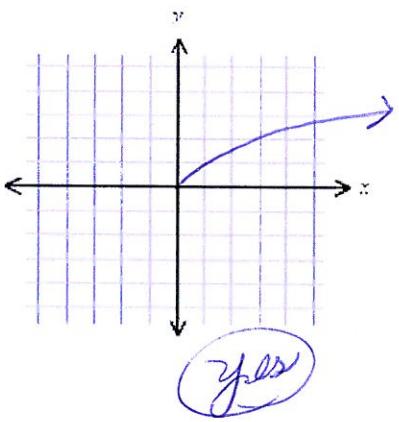
1. $f(x) = 3x - 7$



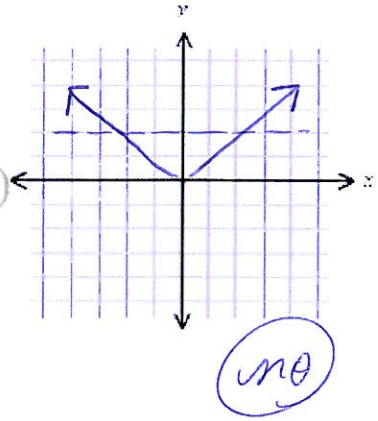
2. $f(x) = x^2 - 9$



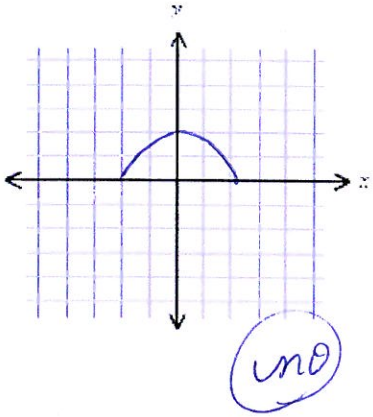
3. $f(x) = \sqrt{x}$



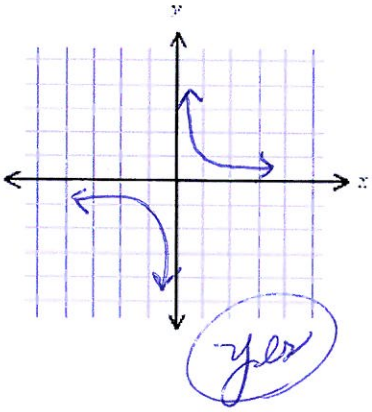
4. $f(x) = |x|$



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

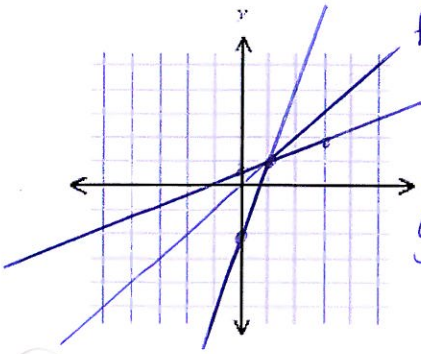


6. $f(x) = \frac{1}{x}$



Prove that f and g are inverse functions of each other and sketch the graphs of f and g on the same coordinate plane.

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



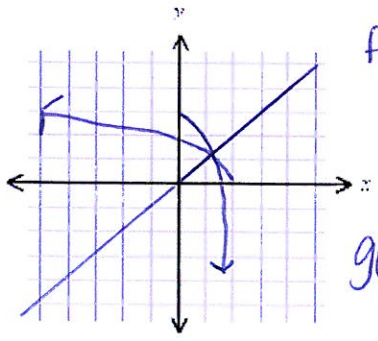
$f(g(x)) = 3\left(\frac{x+2}{3}\right) - 2$

$= x$

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

$= x$

8. $f(x) = -x^2 + 3, x \geq 0$; $g(x) = \sqrt{3 - x}, x \leq 3$



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

$= -(3 - x) + 3 = x$

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

$= \sqrt{x^2} = x$

Find the inverse function of f.

9. $f(x) = 3x + 5$

$y = 3x + 5$

$x = 3y + 5$

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

$f^{-1}(x) = \frac{x-5}{3}$

10. $f(x) = \frac{1}{3x-2}$

$y = \frac{1}{3x-2}$

$x = \frac{1}{3y-2}$

$3xy - 2x = 1$

$\frac{3xy}{3x} = \frac{1+2x}{3x}$

$y = \frac{1+2x}{3x}$

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

11. $f(x) = \frac{3x+2}{2x-5}$

$y = \frac{3x+2}{2x-5}$

$x = \frac{3y+2}{2y-5}$

$2xy - 5x = 3y + 2$

$2xy - 3y = 5x + 2$

$\frac{y(2x-3)}{(2x-3)} = \frac{(5x+2)}{(2x-3)}$

$y = \frac{5x+2}{2x-3}$

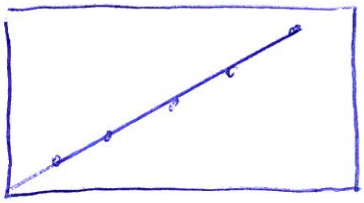
$f^{-1}(x) = \frac{5x+2}{2x-3}$

12. The table lists the total numbers of radio stations in the United States for certain years.

Year	Number
1950	2773
1960	4133
1970	6760
1980	8566
1990	10,819

(a) Plot the data.

[1940, 2000, 10] by [0, 13000, 1000]



(b) Determine a linear function $f(x) = ax + b$ that models these data, where x is the year. Plot f and the data on the same coordinate axes.

(1950, 2773) (1990, 10,819)

$m = \frac{10819 - 2773}{1990 - 1950} = 201.15$

$y = 201.15x + b$

$2773 = 201.15(1950) + b$

$-389{,}469.5 = b$

$y = 201.15x - 389469.5$

or

$y = 205.25x - 397732.3$

(c) Find $f^{-1}(x)$. Explain the significance of f^{-1}.

$y = 201.15x - 389469.5$

$x = 201.15y - 389469.5$

$x + 389469.5 = 201.15y$;

$\frac{x + 389469.5}{201.15} = y = f^{-1}(x)$ or $\frac{x + 397732.3}{205.25} = y$

(d) Use f^{-1} to predict the year in which there were 7744 radio stations.

$f^{-1}(7744) = \frac{7744 + 389469.5}{201.15} \approx 1974.7 \approx 1975$