Pre-Calculus
Practice Problems

Name:

Station 1: Inverses and Functions

Let $f(x) = 9 - x$, $g(x) = x^2 + x$, and $h(x) = x - 2$. Compute the following:

10. $g(f(3))$

$f(3) = 9 - 3 = 6$

$g(6) = 6^2 + 6 = 42$

11. $f(g(4))$

$g(4) = 4^2 + 4 = 20$

$f(20) = 9 - 20 = -11$

12. $h(f(-6))$

$f(-6) = 9 - (-6) = 15$

$h(15) = 15 - 2 = 13$

13. $f(h(-3))$

$h(-3) = -3 - 2 = -5$

$f(-5) = 9 - (-5) = 14$

14. $h(g(11))$

$g(11) = 11^2 + 11 = 132$

$h(132) = 132 - 2 = 130$

15. $g(h(-9))$

$h(-9) = -9 - 2 = -11$

$g(-11) = (-11)^2 + (-11)$

$= 110$

The given coordinates are on $f(x)$, find the coordinates for $f^{-1}(x)$

1. (- 2 , 4)

(4, -2)

2. (4 , 7)

(7, 4)

3. (0 , 11)

(11, 0)

4. (- 3 , - 8)

$(-8,-3)$

5. (10, 10)

$(10,10)$

Find the algebraic inverse.

7. $f(x) = 15x - 1$

$y = 15x - 1$

$x = 15y - 1$

$x + 1 = 15y$

$\frac{x+1}{15} = y$

8. $f(x) = \frac{1}{3}x + 7$

$y = \frac{1}{3}x + 7$

$x = \frac{1}{3}y + 7$

$x - 7 = \frac{1}{3}y$

$3(x-7) = y$

9. $f(x) = -5x - 11$

$y = -5x - 11$

$x = -5y - 11$

$x + 11 = -5y$

$\frac{x+11}{-5} = y$

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

$y = (x-2)^2$

$x = (y-2)^2$

$\sqrt{x} = y-2$

$\sqrt{x}+2 = y$

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

$y = \sqrt{x-4}$

$x = \sqrt{y-4}$

$x^2 = y-4$

$x^2+4 = y$

Graph the function and its inverse of the given function.

12.

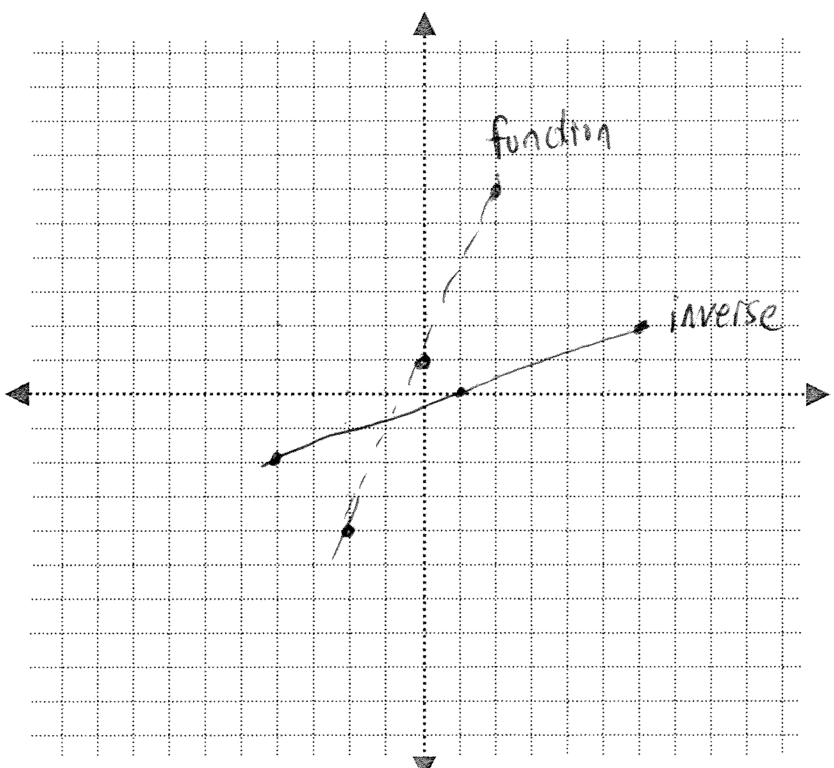
Function

Points

(- 2 , - 4)

(0 , 1)

(2 , 6)



Inverse

Points

(-4, -2)
(1,0) (6,2)

Name:

13.

Function Points

(4 , 2)

(2 , -2)

(- 1, - 5)

(-3, -7)

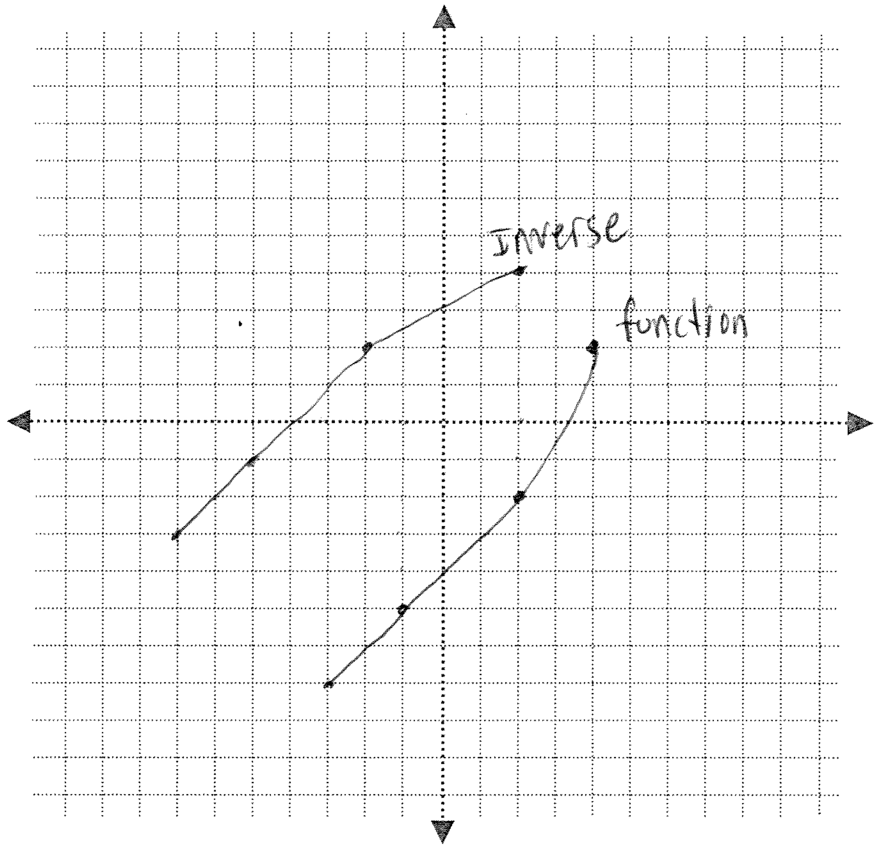
Inverse Points

(2,4)

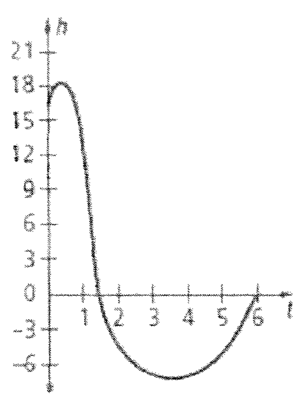
(-2,2)

(-5,-1)

(-7,-3)



14. a. Does the graph pictured represent a function? Explain.



Yes, each x-value (input) has only one output. It passes the vertical line test.

b. Is the graph invertible? Explain.

No; it fails the horizontal line test. Each y-value has more than one x-value.

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Station 2: Rational Functions

For each of the rational functions find: a. holes b. vertical asymptotes c. horizontal asymptotes d. zeros

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

hole: $x=-2$ zero: $x=1$

VA: $x=3$

HA: $y=1$

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

hole: none zero: $x=0$

VA: $x=-1, x=1$

HA: $y=2$

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

hole: none zero: none

VA: $x=2$

HA: $y=0$

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

hole: none zero: $x=\frac{1}{2}$

VA: $x=0$

HA: $y=2$

5. $f(x)=\frac{x^2+x-12}{x^2-9}$ $=\frac{(x+4)\cancel{(x-3)}}{\cancel{(x-3)}(x+3)}$

hole: $x=3$

VA: $x=-3$ zero: $x=-4$

HA: $y=1$

6. $f(x)=\frac{x^2-4}{x+3}$ $=\frac{(x+2)(x-2)}{x+3}$

hole: none zero: $x=-2, x=2$

VA: $x=-3$

HA: none

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

hole: none
VA: $x=-1$
HA: none
zero: $x=0$ $x=1$

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

hole: none
VA: $x=1$
HA: none
zero: $x=2, x=-1$

9. $f(x)=\frac{x+1}{x^2+3x+2} = \frac{\cancel{x+1}}{(x+2)\cancel{(x+1)}}$

hole: ~~none~~ $x=-1$
VA: $x=-2$
HA: $y=0$
zero: none

10. $f(x)=\frac{x^2-9}{x^2-2x-3} = \frac{(x+3)\cancel{(x-3)}}{\cancel{(x-3)}(x+1)}$

hole: $x=3$
VA: $x=-1$
HA: $y=1$
zero: $x=-3$

Simplify each expression.

1. $\frac{x-4}{3}+\frac{5x}{3} = \frac{x-4+5x}{3} = \frac{6x-4}{3}$

same denominator

4. $\frac{3x-8}{4x}+\frac{-x+8}{4x} = \frac{3x-8-x+8}{4x}$

$= \frac{2x}{4x} = \frac{1}{2}$

26. $\frac{5x-3}{4x}-\frac{1}{6x} = \frac{6x(5x-3)}{(6x)4x} - \frac{(4x)1}{(4x)6x}$

$= \frac{30x^2-18x}{24x^2} - \frac{4x}{24x^2}$

$= \frac{30x^2-22x}{24x^2}$

$= \frac{2x(15x-11)}{24x^2}$

$= \boxed{\frac{15x-11}{12x}}$

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Station 3: Composite Functions and Others

1. Let C be the function that assigns to a temperature given in degrees Fahrenheit its equivalent in degrees Celsius, and let K be the function that assigns to a temperature given in degrees Celsius its equivalent in degrees Kelvin.

   We have $C(x) = \frac{5}{9}(x - 32)$ and $K(x) = x + 273$.

   a. Write an expression for $K(C(x))$ and interpret its meaning in terms of temperatures.

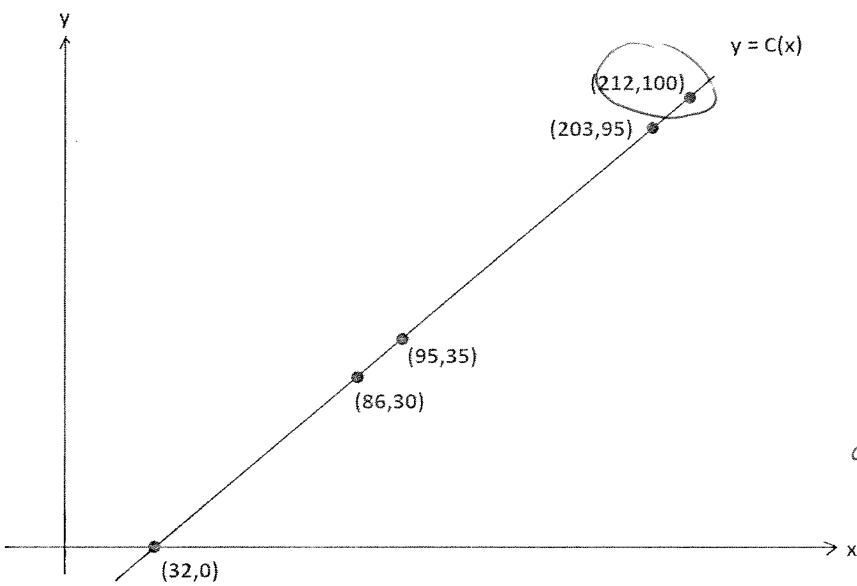
   $$K\left(\tfrac{5}{9}(x-32)\right) = \tfrac{5}{9}(x-32)+273$$

   $C(x)$ $K(x)$
   $°F \rightarrow °C$ $°C \rightarrow K$

   This function converts °F into Kelvin.

   b. The following shows the graph of $y = C(x)$.

   According to the graph, what is the value of $C^{-1}(100)$? $C^{-1}(100) = 212$



   $C(x)$
   $°F \rightarrow °C$
   C^{-1}
   $°C \rightarrow °F$

   c. What does $C^{-1}(100)$ mean in the context of this situation?

   A temperature of 100°C is equivalent to 212°F.

   d. What does $K^{-1}(273)$ mean in the context of this situation?

   $K(x)$ $K^{-1}(x)$
   $°C \rightarrow K$ $K \rightarrow °C$

   A temperature of 273 Kelvin will be converted into °C.