Algebra 2 Name _____

Test Review-Variation/Composition/Inverse/Log-Expon. conversion

1. Which is an example of inverse variation?

A $y = 9x$

B $y = \frac{9}{x}$

C $y = \frac{1}{2}bh$

D $y = 2xy$

2. If y varies directly as x, and $y = -6$ when $x = 3$, what is the value of y when $x = 11$?

F 11

G -3

H -22

J -33

$y = kx$ $\quad -6 = k \cdot 3$ $\quad k = -2$ $\quad y = -2x$ $\quad y = -2(11)$ $\quad y = -22$

3. If y varies inversely as x and $x = 20$ when $y = 10$, what is the value of x when $y = 14$?

A 140

B 200

C $\frac{200}{7}$

D $\frac{100}{7}$

$xy = k$ $\quad 20(10) = k$ $\quad k = 200$ $\quad x \cdot 14 = 200$ $\quad x = \frac{200}{14} = \frac{100}{7}$

4. Ohm's law states that voltage (V) varies jointly as the resistance (R) and current (I). If k represents the constant of proportionality, which is the formula for this relationship?

F $V = kIR$

G $V = k\frac{I}{R}$

H $k = VIR$

J $I = kVR$

$V = kRI$

5. The number of days required to build a five-bedroom house varies inversely as the number of construction workers working on the house. If it takes 10 construction workers 7 days to build a house, how long will it take 5 construction workers to build a house?

A 20 days

B 14 days

C 5 days

D 2 days

days $\times$ workers $= k$ $\quad 7 \cdot 10 = k$ $\quad k = 70$

days $\cdot 5 = 70$ $\quad$ days $= \frac{70}{5} = 14$

6. What type of variation is represented in the formula $V = \frac{4}{3}\pi r^3$?

F Direct variation

G Inverse variation

H Joint variation

J Combined variation

$\frac{4}{3}\pi \rightarrow$ constant (could also be considered direct)

7. The surface area (S) of a sphere varies directly as the square of its radius (r). If k represents the constant of proportionality, which is the formula for this relationship?

A $S = kr^2$

B $S = kr^3$

C $S = \frac{k}{r^2}$

D $Sr^2 = k$

$S = k \cdot r^2$

8. What is the constant of variation if y varies directly as x, and $y = 12$ when $x = 4$?

F 60

G 48

H 12

J 3

$y = kx$ $\quad 12 = k \cdot 4$ $\quad k = 3$

9. The number of floors in a building varies inversely as the distance between floors. The building has 32 floors that are 12 feet apart. If a construction crew decides to increase the distance between floors to 16 feet, how many floors will be in the building?

A 4 floors

B 8 floors

C 16 floors

D 24 floors

floors $\cdot$ distance $= k$ $\quad 32 \cdot 12 = k = 384$

floors $\cdot 16 = 384$ $\quad$ # floors $= 384/16 = 24$

10. The amount of sales tax charged on an item varies directly as the cost of the item. If the sales tax on a \$60.00 purchase is \$2.70, what will be the sales tax on a \$280.00 purchase?

F \$12.60

G \$8.10

H \$7.00

J \$4.67

tax $= k \cdot$ price $\quad 2.70 = k \cdot 60$ $\quad k = \frac{2.70}{60} = .045$

tax $= .045(280)$ $\quad = \$12.60$

Find the following composition of functions:

11) $f(x)=2x+5$, $g(x)=3-4x$

Find $f \circ g(1)$

$g(1) = 3-4(1) = -1$

$f(-1) = 2(-1)+5$

$= 3$

12) $f(x)=2x+7$, $g(x)=-5x-1$

Find $f \circ g$

$f(-5x-1)$

$= 2(-5x-1)+7$

$= -10x-2+7$

$= -10x+5$

13) $f(x)=x^2+x$, $g(x)=1+2x$

Find $g \circ f$

$g(x^2+x)$

$= 1+2(x^2+x)$

$= 1+2x^2+2x$

14) $f(x)=6-2x$ Determine if f and g are inverse functions and explain why or why not.

$g(x)=\frac{6-x}{2}$

$f \circ g = f\left(\frac{6-x}{2}\right)$

$= 6-2\left(\frac{6-x}{2}\right)$

$= 6-(6-x) = x$

$g \circ f = g(6-2x)$

$= \frac{6-(6-2x)}{2} = \frac{2x}{2} = x$

Yes they are inverse functions $f \circ g = x$ $g \circ f = x$

15) Find the inverse of each function and determine whether or not the inverse is a function. If the inverse is not a function, explain why not.

a) $q(x)=\frac{2}{3}x+5$

Inverse

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

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

$\frac{3}{2}(x-5) = y = q^{-1}$

yes, inverse is a function

b) $f(x)=\frac{x-7}{2}$

Inverse

$x = \frac{y-7}{2}$

$2x = y-7$

$f^{-1} = y = 2x+7$

yes, inverse is a function

c) $\{(-5,1),(2,-8),(-3,5),(0,1)\}$

$\{(1,-5), (-8,2), (5,-3), (1,0)\}$ → Not a function (domain value of 1 repeats (mapped to different y-values)

16) In #15 above, which are considered one-to-one functions? a+b

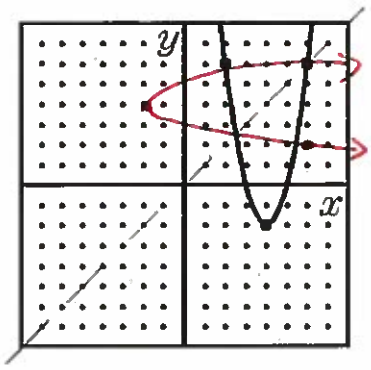
(If the inverse is also a function, then they are one-to-one)

17) In order for $f(x)$ *and* $g(x)$ to be inverse functions, $[f \circ g](x) = [g \circ f](x) =$ x

(symmetry over line $y=x$)

18) Sketch the inverse of each graph onto the same coordinate plane. (Remember to use the coordinates points of the original to help you plot the inverse!) Answer the questions.

Fn
(4, -2)
(2, 6)
(6, 6)

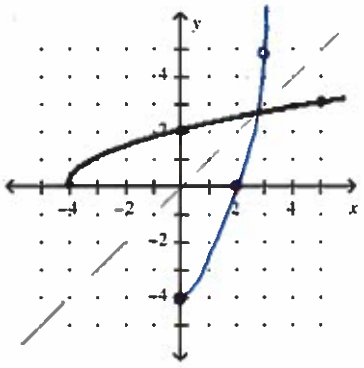


Inverse
(-2, 4)
(6, 2)
(6, 6)

Is the inverse a function? No
Is the original a 1-to-1 function? No
Domain of $f(x)$ $(-\infty, \infty)$
Range of $f(x)$ $[-2, \infty)$

The domain and range switch

Domain of $f^{-1}(x)$ $[-2, \infty)$
Range of $f^{-1}(x)$ $(-\infty, \infty)$



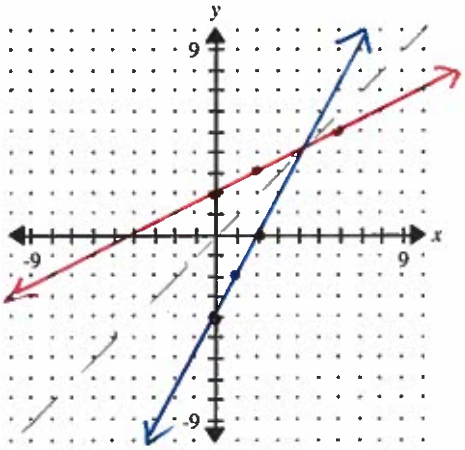
Fn
(-4, 0)
(0, 2)
(5, 3)

Inverse
(0, -4)
(2, 0)
(3, 5)

Is the inverse a function? yes
Is the original a 1-to-1 function? yes
Domain of $f(x)$ $[-4, \infty)$
Range of $f(x)$ $[0, \infty)$

Domain of $f^{-1}(x)$ $[0, \infty)$
Range of $f^{-1}(x)$ $[-4, \infty)$

19) Find the inverse of $y = \frac{1}{2}x + 2$. Then graph both the original equation and it's inverse on the graph below:



Inverse
$x = \frac{1}{2}y + 2$
$(x - 2 = \frac{1}{2}y) \cdot 2$
$2x - 4 = y$
(symmetry over line $y=x$)

20) What is the inverse equation of the exponential function: $y = 4^x$? omit

Convert each equation from exponential to log form or vice versa: omit

21) $y = 10^5$

22) $(x-1)^4 = 512$

23) $8 = 4^{x-2}$

24) $\log_4 x = 5$

25) $7 = \log_x 49$

26) $\log_{2x+3} 569 = 4$