Name: _____ Date: _____ **Unit 3 Class Work**

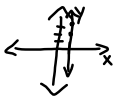
Writing and Evaluating Functions Class Work

Objective: You will be able to model situations by writing functions, analyze functions, and evaluate functions for specific inputs.

✱ One of the equations below is a function.
Work with your partner to determine which equation is a function.

$y = \pm\sqrt{(x+5)}$ $\quad$ $y = 3x - 2$ $\quad$ $x = 1$

x	y
1	2
1	3



*Another notation that we can use to represent this function is…

$f(x) = 3x - 2$

Why use this notation?! • more efficient expressi
• useful when more than 1 function is involved

*What is the difference between y = 3x + 2 and f(x) = 3x + 2?

Notation
$f(x) \leftrightarrow y$

Consider the function f(x) = 3x + 2.

1. What happens when x = 6?

"substitute 6 for every "x"

$f(x) = 3x+2$
$f(6) = 3(6)+2$
just notation $\boxed{f(6) = 20}$

2. What happens when x = w + 1?

evaluate:
Substitute "x" with (w+1)

$f(x) = 3x+2$
$f(w+1) = 3(w+1)+2$
$\boxed{f(w+1) = 3w+5}$

3. Evaluate each:

a. f(-2)

$f(x)$ $x=-2$
$f(2) = 3(-2)+2$
$\boxed{f(-2) = -4}$

b. f(m²)

$f(m^2) = 3(m^2)+2$
$f(m^2) = 3m^2+2$

c. f(q – 2)

$f(q-2) = 3(q-2)+2$
$\boxed{f(q-2) = 3q-4}$

$f(-3) = -7$

$2f(-3)$ means $2 \cdot f(-3)$
$2 \cdot f(-3) = 2 \cdot (3(-3)+2)$
$2f(-3) = 2(-7)$
$\boxed{2f(-3) = -14}$

This means f(-3) is then multiply by 2.

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Writing and Evaluating Functions Class Work

Objective: You will be able to model situations by writing functions, analyze functions, and evaluate functions for specific inputs.

Function Notation: f(x) is read as, "function of "x"
output when x is the input
✱ f(input) = output ✱

We use this notation to represent function rules. Be aware that functions can be named with ANY letter, not always f. For example, circumference of a circle may be given as c(r), since it is a function of the radius of the circle.

"h of w²)

Common Error Analysis:
Given h(x) = 2x² – x + 3, a student claims that h(r²) simplifies to r⁴–r². This student applied his/her knowledge of parentheses in mathematics incorrectly. Describe and correct the students' error.

In this case, the parentheses indicate the INPUT, not multiplication.

Practice Evaluating Functions

Provided with the following functions, determine each.

$p(x) = \frac{3}{x} + 4$ $\quad$ $q(b) = 3b^3 - 2b + 1$ $\quad$ $j(k) = -\frac{1}{4}k + \frac{3}{4}$ $\quad$ $h(d) = \frac{2}{3}(d+2)^2$

1. p(0)

$p(0) = \frac{3}{0} + 4$
undefined

2. p(6x)

$p(6x) = \frac{3}{6x} + 4$
$p(6x) = \frac{1}{2x} + 4$

3. h(1)

$h(1) = \frac{2}{3}(1+2)^2$
$h(1) = \frac{2}{3}(3^2)$
$h(1) = \frac{2}{3}(9)$
$\boxed{h(1) = 6}$

4. q(x³)

$(x \cdot x \cdot x) \cdot (x \cdot x \cdot x)$
$q(x^3) = 3(x^3)^3 - 2x^3 + 1$
$\boxed{q(x^3) = 3x^9 - 2x^3 + 1}$

5. 3j(20)

$3j(20) = 3(\frac{1}{4}20 + \frac{3}{4})$
$3j(20) = 3(-5 + \frac{3}{4})$
$3j(20) = 3(-\frac{18}{4} + \frac{3}{4})$
$= 3(-\frac{15}{4}) = \boxed{-\frac{51}{4}}$

6. 2h(-18)

$2h(-18) = 2(\frac{2}{3}(-18+2)^2)$
$= 2(\frac{2}{3}(-16)^2)$
$= 2(\frac{2}{3}(256))$
$= 2(\frac{512}{3})$
$= \frac{1}{3} + \frac{24}{3} = \boxed{\frac{23}{3}} * 2$
$= \boxed{\frac{46}{3}}$

7. q(m + 1)

⑦ $q(b) = 3b^3 - 2b + 1$
$q(m+1) = 3(m+1)^3 - 2(m+1) + 1$
$q(m+1) = 3(m+1)(m+1) - 2m - 2 + 1$
$q(m+1) = 3(m^2 + 2m + 1) - 2m - 1$
$q(m+1) = 3m^2 + 6m + 3 - 2m - 1$
$\boxed{q(m+1) = 3m^2 + 4m + 2}$

8. j(-½k)

⑧ $j(k) = -\frac{1}{4}k + \frac{3}{4}$
$j(-\frac{1}{2}k) = -\frac{1}{4}(-\frac{1}{2}k) + \frac{3}{4}$
$\boxed{j(-\frac{1}{2}k) = \frac{1}{8}k + \frac{3}{4}}$

9. 3p(3)

⑨ 3p(3) means "3 times p of 3"
$p(x) = \frac{3}{x} + 4$
$3p(3) = 3 \cdot (\frac{3}{3} + 4)$
$3p(3) = 3(5)$
3 times the output is
$3p(3) = 15$
3 x the output is 15

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$p(x) = \frac{3}{x} + 4$ $\quad q(b) = 3b^2 - 2b + 1$ $\quad j(k) = -\frac{1}{4}k + \frac{3}{4}$ $\quad h(d) = \frac{2}{3}(d+2)^2$

10. q(-1)

$q(-1) = 3(-1)^2 - 2(-1) + 1$

$q(-1) = 3(1) + 2 + 1$

$\boxed{q(-1) = 6}$

11. q(2c²)

$q(2c^2) = 3(2c^2)^2 - 2(2c^2) + 1$

$= 3(2c^2)(2c^2) - 4c^2 + 1$

$\boxed{q(2c^2) = 12c^4 - 4c^2 + 1}$

12. j(4³) $= -15\frac{1}{4}$

13. h(d + 2)

$\frac{2}{3}d^2 + \frac{16}{3}d + \frac{32}{3}$

14. h(-8)

24

15. Choose a value for x that would result in p(x) = 3

$x = -3$

$p(-3) = \frac{3}{-3} + 4$

$= -1 + 4 = 3$ ✓

always apply exponents before multiplying

$(2c^2)^2$

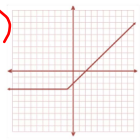
$= (2c^2) \cdot (2c^2)$

$= 4c^4$

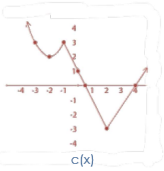
Practice Evaluating Functions (from graphs)

Remember, _____ = _____

Examples:



g(x)



c(x)

1. g(-1) = _____ because...

2. c(___) = 3 because...

- Now You Try Some! *Determine each of the following.*

3. g(0) = _____
4. 2c(-1) = _____
5. c(___) = 0
6. c(0) = ___
7. g(___) = 8
8. -8g(-10) = _____
9. c(___) = -3
10. Sketch any graph for a function f(x), for which f(-1) = -2, and f(x) > 0 on the interval (0, 3)

Evaluating From Graphs

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

$f(-5) = 2(-5)^2$

$f(-5) = 2(25)$

$f(-5) = 50$

plug in -5 for x

square -5

multiply

f(input) = output

$f(x) = y$

▷ This is the point $(-5, 50)$

x x f(x)

$f(x) = y$

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$p(x) = \frac{3}{x} + 4$ $\quad q(b) = 3b^2 - 2b + 1$ $\quad j(k) = -\frac{1}{4}k + \frac{3}{4}$ $\quad h(d) = \frac{2}{3}(d+2)^2$

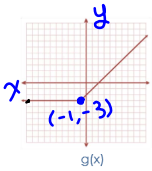
10. q(-1) 11. q(2c²) 12. j(4³)

13. h(d + 2) 14. h(-8) 15. Choose a value for x that would result in p(x) = 3

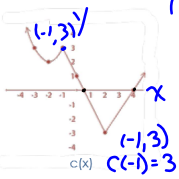
Practice Evaluating Functions (from graphs)

Remember, f(x) = y

Examples:



g(x)



c(x)

(-1,-3)
g(-1) = -3

(-1,3)
c(-1)=3

look at g where x is -1, what is the "y"

1. g(-1) = -3 because... when x is -1, y is -3

2. c(-1) = 3 because... when y is 3, x is -1

look at c where y is 3, what is "x"?

- **Now You Try Some!** *Determine each of the following.*

3. g(0) = -2 (0,-2)

4. 2c(-1) = 6 multiply c(-1) by 2 — 2(3)

5. c(4) = 0 (4,0) ; (½,0) — c(½)=0

6. c(0) = 1 x y

7. g(10) = 8 x y

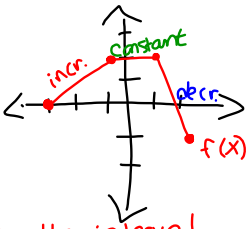
8. -8g(-10) = 24 x -8(-3) — -8(-3)

9. c(2) = -3 x y

10. Sketch any graph for a function f(x), for which f(-1) = -2 and f(x) > 0 on the interval [0, 3]

from 0 to 3

f(-1)=-2 include point (-1,-2)



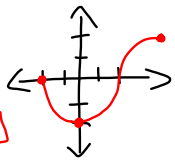
On the interval [-3, -1] f(x) increases

from [-1, 1] f(x) is constant

x: left, right

on [1, 2] f(x) decreases

1



Describe g(x) on [-2,0]

look where x=-2 to x=0

decreasing

Describe g(x) on [0,2]

look where x=0 to x=2

increasing

$r(s) = 2s + 1$

1. Determine $r(0)$

2. Determine $r(4x)$

3. Write any questions you have! :)

Sep 27-8:56 AM

HOMEWORK p. 59-60 #23-29 odd, 46, 50, 51, & 53

AND THIS PROBLEM: The cost of frozen yogurt depends on the number of ounces of yogurt purchased. Explain why this situation can be modeled by a function. If each ounce costs 35 cents, write a function to model the cost for z ounces of frozen yogurt.

CLOSER:

State any **Concept** you **Learned** today

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Show **One Specific Example**

How is this concept **Relevant**, or how do you believe it will be in the future?