Name_____ _ Period_____

Section 2-1 Operations with numbers

Properties of Addition and Multiplication

For all real numbers a, b, and c:

	Addition	Multiplication
Closure	$a + b$ is a real number.	ab is a real number.
Commutative	$a + b = b + a$	$ab = ba$
Associative	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity	There is a number 0 such that $a + 0 = a$ and $0 + a = a$.	There is a number 1 such that $1 \cdot a = a$ and $a \cdot 1 = a$.
Inverse	For every real number a, there is a real number $-a$ such that $a + (-a) = 0$.	For every nonzero real number a, there is a real number $\frac{1}{a}$ such that $a\left(\frac{1}{a}\right) = 1$.

The Distributive Property

For all real numbers a, b, and c:

$a(b + c) = ab + ac$ and $(b + c)a = ba + ca$

State the Property that is illustrated in each statement.

1. v(3t) = (3t)v
2. 4x +13y = 13y + 4x
3. -7 + 7 = 0
4. $m(x^2 + 0020) = mx^2 + mx$
5. (3 +a) + b = 3 + (a +b)
6. $-5x \cdot 0 = 0$
7. $\frac{x}{3} \cdot \frac{3}{x} = 1$

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Order of Operations

If an expression involves only numbers and operations, you can evaluate the expression by using the *order of operations*.

Order of Operations

1. Perform operations within the innermost grouping symbols according to Steps 2–4 below.
2. Perform operations indicated by exponents (powers).
3. Perform multiplication and division in order from left to right.
4. Perform addition and subtraction in order from left to right.

8. $7 - 16 \cdot 6 \div 8 + 8 =$

9. $\dfrac{50 \cdot 5^2 - 2 \cdot 4^2}{4 + 5^2} =$

10. $\dfrac{36 \cdot 3^2 - 4 \cdot 7^2}{7 + 3^2} =$

Section 2-2 Properties of Exponents

Definition of Integer Exponents

Let a be a real number.

If n is a natural number, then $a^n = a \times a \times a \times \cdots \times a$, n times.

If a is nonzero, then $a^0 = 1$.

If n is a natural number, then $a^{-n} = \frac{1}{a^n}$.

11. 4^{-2}

12. $\left(\frac{2}{5}\right)^{-2}$

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Properties of Exponents

Let a and b be nonzero real numbers. Let m and n be integers.

Product of Powers	$(a)^m(a)^n = a^{m+n}$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$
Power of a Power	$(a^m)^n = a^{mn}$
Power of a Product	$(ab)^n = a^n b^n$
Power of a Quotient	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

13. $3x^3(3x^2)$

14. $\frac{(xy^{14})(x^2y)}{(x^7y^5)^2}$ =

15. $\frac{(x^2y^{13})(x^3y)}{(x^4y^2)}$ =

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Definition of Rational Exponents

For all positive real numbers a:

If n is a nonzero integer, then $a^{\frac{1}{n}} = \sqrt[n]{a}$.

If m and n are integers and $n \neq 0$, then $a^{\frac{m}{n}} = \left(a^{\frac{1}{n}}\right)^m = \left(\sqrt[n]{a}\right)^m =$

16. $27^{2/3}$

17. $23^{3/2}$

Section 2-3 Introduction to Functions

Pg 103

State the domain and range of a relation, and state whether it is a function.

The relation $\{(1, 2), (2, 4), (3, 6), (4, 8)\}$ is a function because each x-coordinate is paired with one and only one y-coordinate.

domain: $\{1, 2, 3, 4\}$ range: $\{2, 4, 6, 8\}$

18. Determine whether the relation is a function and state the domain and range.

{[8,9) , (2,4) , (1,3) , (2,9)}

19. Determine whether the relation is a function and state the domain and range.

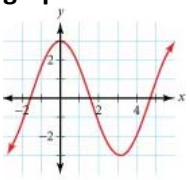
x	y
-7	1
-6	1
-5	13

Pg 103

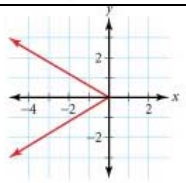
Vertical-Line Test

If every vertical line intersects a given graph at no more than one point, then the graph represents a function.

20. Use the vertical line test to determine if the graph is a function.



21.



Pg 106

Monthly residential electric charges, c, are determined by adding a fixed fee of \$6.00 to the product of the amount of electricity consumed each month, x, in kilowatt-hours and a rate factor of 0.035 cents per kilowatt-hour.

a. Write a linear function to model the monthly electric charge, c, as a function of the amount of electricity consumed each month, x.

b. If a household uses 712 kilowatt-hours of electricity in a given month, how much is the monthly electric charge?

SOLUTION

a. $c(x) =$ **electricity used + fixed fee**

$c(x) = 0.035x + 6.00$

The linear function is $c(x) = 0.035x + 6.00$.

b. Evaluate the function for $x = 712$.

$c(x) = 0.035x + 6.00$

$c(712) = 0.035(712) + 6.00$

$c(712) = 30.92$

For 712 kilowatt-hours of electricity, the monthly charge is \$30.92.

22. Oshin plans to decorate hats to sell at a crafts fair. The decorations cost \$38.50 and the hats cost \$7.00 each.

a. **Write a function expressing the cost, *C(x)*, of the project in terms of the number of hats decorated, *x*.**

b. **Determine the cost of decorating 25 hats.**

c. **How many hats can be decorated with a budget of \$283.50?**

Section 2-4 Operations with Functions

Pg 112

Operations With Functions

For all functions f and g:

Sum	$(f+g)(x) = f(x) + g(x)$
Difference	$(f-g)(x) = f(x) - g(x)$
Product	$(f \cdot g)(x) = f(x) \cdot g(x)$
Quotient	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$, where $g(x) \neq 0$

23. If $f(x) = 16 - x^2$ and $g(x) = 4 - x$, find the function $(f + g)(x)$.

24. If $f(x) = 4 - x^2$ and $g(x) = 2 - x$, find the function $(f - g)(x)$.

25. If $f(x) = 1 - x^2$ and $g(x) = 1 - x$, find the function $(f \cdot g)(x)$.

26. If $f(x) = 5 - x^2$ and $g(x) = 1 - x$, find the function $\frac{f}{g}(x)$. State and domain restrictions.

Pg 113

Composition of Functions

Let f and g be functions of x.

The composition of f with g, denoted $f \circ g$, is defined by $f(g(x))$.

The domain of $y = f(g(x))$ is the set of domain values of g whose range values are in the domain of f. The function $f \circ g$ is called the **composite** function of f with g.

27. For the pair of functions f and g, find $(g \circ f)(x)$ and $(f \circ g)(x)$

$f(x) = 5 + 5x$ and $g(x) = x - 1$

28. For the pair of functions f and g, find $(g \circ f)(x)$ and $(f \circ g)(x)$

$f(x) = 4 + 2x$ and $g(x) = x^2 - 1$