

KEY POINTS

Section 4.2 Functions and Expressions

- Understanding a function's behavior from its form
- Constants and variables
- Equivalent expressions define the same function

Warm - Up

Section 4.2
Functions
and
Expressions

Let $f(x) = 2x^2 + 7x + 5$..

Evaluate $f(4)$

$$\begin{aligned} &2(4)^2 + 7(4) + 5 \\ &2(16) + 28 + 5 \\ &32 + 28 + 5 = 65 \end{aligned}$$

Background

Section 4.2 Functions and Expressions

A function is often defined by an expression.

We find the output by evaluating the expression at the input value.

It is important to pay attention to the form of the expression because it allows us to learn properties of the function.

Examples

Section 4.2 Functions and Expressions

$$A(50) < A(10)$$
$$50 < 90$$

If you charge \$ p for admission to a school dance, the number of people who will attend is given by

$$A(p) = 100 - p$$

Evaluate $A(10)$ and $A(50)$ and give a practical interpretation of the answers.

$$A(10) = 100 - 10 = 90$$

$$A(50) = 100 - 50 = 50$$

This means that if you charge \$10 for admission 90 people attend, and if you charge \$50 for admission 50 people attend.

Use the algebraic form of the expression for $A(p)$ to explain why $A(50) < A(10)$, and explain why the inequality makes sense in practical terms.

The expression for $A(p)$ is $100 - p$. When the value of p increases, the expression value decreases. Since $50 > 10$, we should find that $A(50) < A(10)$ because when we substitute both values in for p , we found that $A(10)$ had a larger solution than $A(50)$.

Examples

Section 4.2 Functions and Expressions

Find the following.

a. $h(0)$ if $h(t) = -16t^2 + 32t + 64$

$$h(0) = -16(0)^2 + 32(0) + 64 \quad h(0) = 64$$

b. $f(x^2)$ if $f(x) = 4x^2 - x$

$$f(x^2) = 4(x^2)^2 - (x^2) \quad \nrightarrow f(x^2) = 4x^4 - x^2$$

c. $A(\pi)$ if $A(r) = \pi r^2$

$$A(\pi) = \pi(\pi)^2 \quad A(\pi) = \pi \cdot \pi^2 = \pi^3$$

d. $g(2+h)$ if $g(t) = t^2 - bt$

$$g(2+h) = (2+h)^2 - b(2+h) = h^2 + 4h + 4 - 2b - h$$

Examples

Section 4.2
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$$f(x) = 3x + 4$$

What are the constants in this function?

3 and 4

What are the variable(s) in this function?

x

$$A(r) = \pi r^2$$

Variables:

r

Constants:

π

Examples

Section 4.2 Functions and Expressions

Identify the variable in each of the following functions.

$$f(x) = mx + b$$

x

$$V(b) = \frac{1}{3}bh$$

b

$$A(l) = \pi r^2 + \pi rl$$

l

$$g(w) = xw + 3wy$$

w

$$S(h) = 2\pi r^2 + 2\pi rh$$

h

$$Z(\alpha) = \frac{\alpha - \mu}{\sigma}$$

α

Examples

Section 4.2 Functions and Expressions

Let $f(t) = t + t^2$. Determine which of the following pairs of expressions are equivalent.

a. $f(2t)$ and $2f(t)$

$$\begin{aligned} f(2t) &= (2t) + (2t)^2 = 2t + 4t^2 \\ 2f(t) &= 2(t + t^2) = 2t + 2t^2 \end{aligned}$$

No

b. $\frac{f(t)}{2}$ and $f\left(\frac{t}{2}\right)$

$$\begin{aligned} \frac{f(t)}{2} &= \frac{t + t^2}{2} \\ f\left(\frac{t}{2}\right) &= \frac{t}{2} + \left(\frac{t}{2}\right)^2 = \frac{t}{2} + \frac{t^2}{4} \end{aligned}$$

No

c. $f(a) + f(b)$ and $f(a + b)$

$$\begin{aligned} f(a) &= a + a^2 \\ f(b) &= b + b^2 \\ f(a) + f(b) &= a + a^2 + b + b^2 \\ f(a + b) &= (a + b) + (a + b)^2 = a + b + a^2 + 2ab + b^2 \end{aligned}$$

No

Homework

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Warm-Up

Let $g(s) = \frac{4s+1}{2s-3}$

Find the following:

$$g(10) = \frac{4(10)+1}{2(10)-3} = \frac{40+1}{20-3} = \frac{41}{17}$$

$$g(a) + 4 = \left(\frac{4a+1}{2a-3} + 4 \right)$$

$$g(a+4) = \frac{4(a+4)+1}{2(a+4)-3} = \frac{4a+16+1}{2a+8-3} = \frac{4a+17}{2a+5}$$





