Precalculus Worksheet

Topic: What is a Function?

Instructions

Answer the following problems.

Practice Problems

1. **Definition of a Function:**
   i. Explain in your own words what a function is.
   ii. Give an example of a relation that is a function.
   iii. Give an example of a relation that is not a function and explain why.
   iv. Describe the vertical line test and its significance.
   v. Provide a real-life example where a function is used.
   vi. Identify whether mapping a student to their ID number is a function.
2. **Identify Functions:** Determine whether the following relations are functions. Explain your reasoning.
   i. $\{(1,2),(2,3),(3,4),(4,5)\}$
   ii. $\{(1,2),(2,3),(3,2),(4,5)\}$
   iii. $y^2 = x + 4$
   iv. $y = x^2$
   v. $x = y^2$
   vi. $y = \sqrt{x}$ (for $x \geq 0$)
3. **Function Evaluation:** Given $f(x) = 2x^2 - 3x + 5$, find the following:

i. $f(2)$
ii. $f(-1)$
iii. $f(a)$
iv. $f(a+1)$
v. $f(0)$
vi. $f(\sqrt{3})$

4. **Domain and Range:** Find the domain and range of the following functions:

i. $f(x) = \sqrt{x-1}$
ii. $f(x) = \frac{1}{x+3}$
iii. $f(x) = x^2 - 4$
iv. $f(x) = |x-2|$
v. $f(x) = \frac{1}{\sqrt{x}}$
vi. $f(x) = \ln(x)$ (natural logarithm)

5. **Complete the table for the following functions:**

i. $f(x) = 3x^2 - 2x + 1$

X	-2	-1	0	1	2
$f(x)$					

ii. $g(x) = |x-3|$

X	0	1	2	3	4
$f(x)$					

6. **Evaluate the following functions at the indicated values:**

i. $f(x) = x^2 + 2x - 5$: $f(-2)$, $f(3)$, $f(\frac{1}{2})$, $f(a)$, $f(a+2)$
ii. $g(x) = \sqrt{x+1}$: $g(0)$, $g(3)$, $g(-1)$, $g(\frac{4}{9})$
iii. $h(x) = \frac{x}{x+1}$: $h(0)$, $h(1)$, $h(-\frac{1}{2})$, $h(2a)$

7. **Inverse Functions:** Find the inverse of the following functions:

i. $f(x) = 3x + 4$
ii. $f(x) = \frac{x-2}{5}$
iii. $f(x) = x^2$ (restrict the domain to $x \geq 0$)
iv. $f(x) = \ln(x)$
v. $f(x) = e^x$ (exponential function)
vi. $f(x) = \sqrt{x+1}$

8. **Piecewise Functions:** Evaluate the following piecewise function at the given points:

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2x + 3 & \text{if } x \geq 0 \\ -x & \text{if } x > 5 \end{cases}$$

   i. $f(-2)$
   ii. $f(0)$
   iii. $f(3)$
   iv. $f(6)$
   v. $f(-5)$
   vi. $f(7)$

Multiple Choice Questions

1. Which of the following represents a function?

   A. $\{(1, 2), (2, 3), (3, 4)\}$
   B. $\{(1, 2), (1, 3), (2, 4)\}$
   C. $x = y^2$
   D. $y = \pm x$

2. What is the domain of $f(x) = \sqrt{x - 4}$?

   A. $x \geq 4$
   B. $x > 4$
   C. $x \leq 4$
   D. All real numbers

3. What is the range of $f(x) = x^2 - 4$?

   A. $y \geq -4$
   B. $y > -4$
   C. $y \leq -4$
   D. All real numbers

4. If $f(x) = 2x + 1$, what is $f(f(2))$?

   A. 9
   B. 11
   C. 13
   D. 15