

Name: \_\_\_\_\_

Period: \_\_\_\_\_

## Relations & Functions — Test 2

“A little tricky, but you’ve got this. Average-rate-of-change is just ‘slope with manners.’”

### Quick Reference (Read Me!)

**Domain:** all allowed inputs ( $x$ -values).    **Range:** all outputs ( $y$ -values).

**$x$ -intercepts:** solve  $f(x) = 0$  (points look like  $(x, 0)$ ).     **$y$ -intercept:** evaluate  $f(0)$  (point  $(0, f(0))$ ).

**Increasing / Decreasing (simple idea):** for  $x_2 > x_1$ , compare  $f(x_2)$  to  $f(x_1)$ .

**Average rate of change on  $[a, b]$ :**  $\frac{f(b) - f(a)}{b - a}$  (units: “output per input”).

1. (8 points) **Domain & Range from ordered pairs.**

A function  $F$  is given by the set of points

$$\{(-2, 1), (0, 3), (1, 3), (3, -1), (4, 0)\}.$$

- (a) State the domain and the range.

- (b) List all  $x$ -intercepts and the  $y$ -intercept (if any).

2. (8 points) **Table  $\rightarrow$  increasing/decreasing/constant.**

A function  $f$  has the values:

$x$	-3	-1	0	2	4
$f(x)$	5	4	4	3	3

- (a) On which subinterval(s) of the  $x$ -values does  $f$  appear increasing? Decreasing? Constant?

- (b) Briefly explain how you decided using the definition idea (compare  $f(x_2)$  vs  $f(x_1)$  when  $x_2 > x_1$ ).

3. (10 points) **Intercepts and average rate (linear).**  
Let  $f(x) = 4 - 2x$ .

- (a) Find the  $x$ -intercept(s).

- (b) Find the  $y$ -intercept.

- (c) Compute the average rate of change on  $[1, 4]$ .

4. (12 points) **A “holey” situation (domain/range thinking).**

Consider  $p(x) = \frac{x^2 - 9}{x - 3}$ .

(a) State the domain.

(b) Find the  $y$ -intercept (if it exists).

(c) Find all  $x$ -intercepts (if any).

(d) Is  $y = 6$  in the range? Explain in one sentence.

5. (10 points) **Root domain/range.**  
Let  $q(x) = \sqrt{7 - x}$ .

(a) State the domain.

(b) State the range.

- (c) Find the  $x$ - and  $y$ -intercepts (exact forms).

6. (8 points) **Average rate of change from a table.**

For a function  $m$ :

$x$	0	2	5	6
$m(x)$	4	10	25	28

Compute the average rate of change on  $[0, 2]$ ,  $[2, 5]$ , and  $[5, 6]$ . Include units like “output per input.”

7. (10 points) **Basketball: scoring pace.**

A team's points  $P(t)$  after  $t$  minutes of a game are recorded:

$t$ (min)	0	8	16	24	32
$P(t)$	0	12	23	35	50

- (a) Average rate of change on  $[0, 16]$  and on  $[16, 32]$  (units?).

- (b) During which half was the scoring pace higher? How do you know?

8. (8 points) **Basketball: free throws model.**

A player's made free throws are modeled by  $F(n) = 0.75n$ , where  $n$  is the number of attempts.

- (a) What is a reasonable domain in this context? What is the range?

- (b) Compute the average rate of change from  $n = 20$  to  $n = 28$  and interpret.

9. (8 points) **Monotonicity with a linear function.**

Let  $s(x) = -3x + 1$ . Is  $s$  increasing or decreasing on all real numbers? Justify using the idea “for  $x_2 > x_1$ , compare  $s(x_2)$  and  $s(x_1)$ .”

10. (8 points) **Intercepts from a table.**

$x$	-2	-1	0	1	2
$y$	0	2	3	2	0

List all  $x$ -intercepts and the  $y$ -intercept. Then say where the function appears increasing and where it appears decreasing (based on the table only).

11. (8 points) **General AROC for a line.**  
For  $r(x) = ax + b$  with constants  $a, b$ , find the average rate of change on  $[x_1, x_2]$  (assume  $x_2 > x_1$ ). What does this say about lines?

12. (10 points) **Basketball: score difference.**  
Let  $S(t) = 12 - 0.5t$  represent “home score minus visitor score” after  $t$  minutes (first 30 minutes only).

(a) What is the  $y$ -intercept and what does it mean?

(b) When is the game tied for the first time?

(c) Is  $S$  increasing or decreasing? Interpret your answer in basketball terms.

