

AP Precalculus
Average Rates and Speed in Parametric Motion

Average Rates and Speed in Parametric Motion | APPC-U04-P04

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for classification and slope, classification, slope, and orientation, slope status, slope status and direction, two ordered pairs and two rate pairs and scale factor.

8 PDFs and a README; 141 buyer pages.

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Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Find the average horizontal and vertical rates over the interval.

Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

t	x	y
1	2	-1
3	8	5

Condition or evidence	Supplied value
Original interval or clock definition	$1 \leq t \leq 3$ seconds
Units	meters

Bank label: _____

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Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Find average speed and average-velocity magnitude.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

t	x	y
0	0	0
2	8	0
5	3	0

Condition or evidence	Supplied value
Original interval or clock definition	$0 \leq t \leq 5$ seconds
Segments	straight between rows
Units	meters

Find the endpoint after the stated interval.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Condition or evidence	Supplied value
Given component averages	−4 5
Original interval or clock definition	three-parameter-unit interval
Start	8 −1

Compute both exact average coordinate rates.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Condition or evidence	Supplied value
Original interval or clock definition	$3 \leq t \leq 8$ seconds
X rule	$x = \sqrt{t+1}$ meters
Y rule	$y = \frac{1}{t}$ meters

Determine the endpoint-secant slope from the exact rates.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Condition or evidence	Supplied value
Given average x-rate	$\frac{1}{3}$
Given average y-rate	0
Original interval or clock definition	common nonzero interval

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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: Average speed 2 meters per second; average-velocity magnitude $\frac{1}{2}$ meter per second.

Reconstruct the initial position that is compatible with the endpoint and both average rates.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

Condition or evidence	Supplied value
Given component averages	-2
	3
Original interval or clock definition	four-second observation window
End	5
	8

Your response: _____

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Diagnose and repair the student's calculation.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

Condition or evidence	Supplied value
Original interval or clock definition	$2 \leq t \leq 5$ seconds
End point	7 11
Start point	1 2
Student claim to examine	The average vertical rate is $\frac{\Delta y}{\Delta x} = \frac{9}{6} = \frac{3}{2}$ meters per second.

A student claims: "The endpoint displacement is right and down, so the object moves right and down throughout the sampled interval." Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete the stated task: Use all rows, not just the endpoints, to describe net direction and any observed reversals.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

t	x	y	Condition or evidence	Supplied value
0	-2	6	Original interval or clock definition	$0 \leq t \leq 4$ seconds
1	-5	4	Student claim to examine	The endpoint displacement is right and down, so the object moves right and down throughout the sampled interval.
3	-1	4		
4	2	1		

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Full Worked Solutions - excerpt

Worked example

Problem. Determine the endpoint-secant slope from the exact rates.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Condition or evidence	Supplied value
Given average x -rate	$\frac{1}{3}$
Given average y -rate	0
Original interval or clock definition	common nonzero interval

Answer. 0

Explanation and check.

The nonzero horizontal rate permits division, and 0 divided by $\frac{1}{3}$ is 0.

Worked example

Problem. Determine the two finite coordinate rates across the entire parameter interval.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

Condition or evidence	Supplied value
Original interval or clock definition	$1 \leq t \leq 4$
X	$3t - 2$
Y	$t^2 - 5$

Answer. (3, 5)

Explanation and check.

The endpoints change from $(1, -4)$ to $(10, 11)$, giving changes 9 and 15 over an interval of length 3.