4.2a / Practice workbook

Straight-Line Motion: Velocity, Acceleration, Direction

Practice

Problems 1–6 / Show your reasoning

1 A particle moves along the x-axis with position $x(t) = t^3 - 9t^2 + 24t$ for $t \geq 0$. For what values of t is the particle moving to the left?

A. $0 < t < 2$

B. $2 < t < 4$

C. $t > 4$

D. $0 < t < 3$

4.2a / AP-style free response

Problem 2 ➤ / *Show the work and the reasons a grader looks for.*

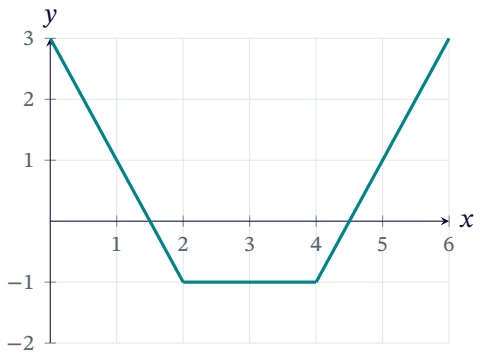
A particle moves along the x-axis with position $x(t) = t^2 - 6t + 5$ for $0 \le t \le 5$.

(a) At what time is the particle at rest?

(b) Find the total distance traveled by the particle for $0 \le t \le 5$.

(c) Find the displacement of the particle for $0 \le t \le 5$.

3 The graph of the velocity $v(t)$ of a particle moving along a line, $0 \leq t \leq 6$, is made of three segments. At what times in $0 < t < 6$ does the particle change direction?



A. $t = 1.5$ only
B. $t = 4.5$ only
C. $t = 1.5$ and $t = 4.5$
D. $t = 2$ and $t = 4$

4.2a / AP-style free response

Problem 4 ➤ */ Show the work and the reasons a grader looks for.*

A particle moves along the x-axis with position $x(t) = 3\cos\left(\frac{\pi t}{3}\right)$ for $0 \le t \le 6$.

(a) Find $v(1)$. Is the particle moving left or right at $t = 1$? Give a reason.

(b) Find $a(3)$.

5 A particle moves along the x-axis with position $x(t) = t - 2\ln(t+1)$ for $t \geq 0$. What is the acceleration of the particle at the time when its velocity is zero?

A. 0
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. 1

4.2a / AP-style free response

Problem 6 ➤ / *Show the work and the reasons a grader looks for.*

Two particles move along the x-axis for $0 \le t \le 6$ with positions $x_A(t) = t^2 - 4t$ and $x_B(t) = 10t - t^2$. On what intervals in $0 < t < 6$ are they moving in the ==same== direction? Justify your answer.

4.2a / Answer key

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1 (B)

2 (a) 3; (b) 13; (c) -5

3 (C)

4 (a) $v(1) = -\frac{\sqrt{3}\pi}{2} < 0$: moving left; (b) $pi * *2/3$

5 (C)

6 $2 < t < 5$: v_A and v_B are both positive there