

5. Two particles move along the x -axis. For $0 \leq t \leq 8$, the position of particle P at time t is given by

$$x_P(t) = \ln(t^2 - 2t + 10), \text{ while the velocity of particle } Q \text{ at time } t \text{ is given by } v_Q(t) = t^2 - 8t + 15.$$

Particle Q is at position $x = 5$ at time $t = 0$.

- (a) For $0 \leq t \leq 8$, when is particle P moving to the left?
 - (b) For $0 \leq t \leq 8$, find all times t during which the two particles travel in the same direction.
 - (c) Find the acceleration of particle Q at time $t = 2$. Is the speed of particle Q increasing, decreasing, or neither at time $t = 2$? Explain your reasoning.
 - (d) Find the position of particle Q the first time it changes direction.
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