

You *MAY NOT* use a calculator.

For  $0 \leq t \leq 12$ , a particle moves along the  $x$ -axis. The velocity of the particle at time  $t$  is given by  $v(t) = \cos\left(\frac{\pi}{6}t\right)$ . The particle is at position  $x = -2$  at time  $t = 0$ .

- (a) For  $0 \leq t \leq 12$ , when is the particle moving to the left?

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- (b) Write, but do not evaluate, an integral expression that gives the total distance traveled by the particle from time  $t = 0$  to  $t = 6$ .

(c) Find the acceleration of the particle at time  $t$ . Is the speed of the particle increasing, decreasing, or neither at time  $t = 4$ ? Explain your reasoning.

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(d) Find the position of the particle at time  $t = 4$ .