AP Physics C
Drozdoff 8–9
Quiz Solutions — Chapter 2, 8/30/2007

1 position is distance from origin; displacement is change in position

2 velocity is a vector; speed is a scalar; mention that student should use words "vector" and "scalar" if he/she did not but still provided appropriate explanation (i.e., velocity has a direction while speed does not)

3 average velocity is $\bar{\mathbf{v}} = \frac{\Delta \mathbf{x}}{\Delta t}$; instantaneous velocity is $\mathbf{v} = \frac{d\mathbf{x}}{dt}$; mention that student should use word "derivative" if he/she did not

4 $\mathbf{a} = \frac{d\mathbf{v}}{dt} = \frac{d^2\mathbf{x}}{dt^2}$ $\left(\text{accept scalar equivalent } a = \frac{dv}{dt} = \frac{d^2x}{dt^2}\right)$

5 $\mathbf{v}(t) = \mathbf{a}t + \mathbf{v}_0$

6 $\mathbf{v}(t) = \int \mathbf{a}\, dt = \mathbf{v}_0 + \mathbf{a}\Delta t$; no loss of points for failing to use vectors

7 when $\frac{d\mathbf{v}}{dt} > 0$; that is, $t \in (0\text{ s}, 13\text{ s}) \cup (45\text{ s}, 65\text{ s}) \cup (69\text{ s}, 71\text{ s})$; all three intervals required with each endpoint ± 1 ; $-\frac{1}{2}$ if missing one or two intervals or part of an interval correct

8 when $\frac{d\mathbf{v}}{dt} < 0$; that is, $t \in (19\text{ s}, 45\text{ s}) \cup (65\text{ s}, 69\text{ s})$, each endpoint ± 1 ; $-\frac{1}{2}$ if missing one interval or part of an interval correct

9 when $\mathbf{v}(t) = 0$; that is, $t \in \{0\text{ s}, 45\text{ s}, 69\text{ s}\}$, latter two ± 1

10 $$\begin{aligned}\Delta \mathbf{x}_{0\text{ s}}^{71\text{ s}} = \int_{0\text{ s}}^{71\text{ s}} \mathbf{v}\, dt &= \tfrac{1}{2}(13 \cdot 26) + (19 - 13) \cdot 26 + \tfrac{1}{2}(45 - 19) \cdot 26 \\ &\quad - \tfrac{1}{2}(65 - 45)20 - \tfrac{1}{2}(69 - 65) \cdot 20 + \tfrac{1}{2}(71 - 69) \cdot 10 \\ &= 433\text{ m}\end{aligned}$$

(accept ± 20 or so at discretion; no partial credit if no work shown ; $-\frac{1}{2}$ if no units)

11 $\left.\frac{d\mathbf{v}}{dt}\right|_{t \text{ from } 66\text{ s to } 72\text{ s}} = 5\text{ m} \cdot \text{s}^{-2}$; $-\frac{1}{2}$ if no units; no partial credit if no work shown