2007 Form B AB2

A. $Acceleration = v'(t) = \left.\frac{d(\sin(t^2))}{dt}\right|_{t=3} = -5.467 \text{ or } -5.466$

B. $\text{Total Distance} = \int_0^3 \left|\sin(t^2)\right| dt = 1.702$

C. $\text{Position} = 5 + \int_0^3 \sin(t^2)\,dt = 5.773 \text{ or } 5.774$

D. Particle comes to a stop and changes direction at t = 1.772, 2.5066, 3.06998, 3.544907

Using the equation in part C and evaluating the position at these times yields the following positions

$$\text{Position}(1.772) = 5 + \int_0^{1.772} \sin(t^2)\,dt = 5.894$$

$$\text{Position}(2.5066) = 5 + \int_0^{2.5066} \sin(t^2)\,dt = 5.430$$

$$\text{Position}(3.06998) = 5 + \int_0^{3.06998} \sin(t^2)\,dt = 5.788$$

$$\text{Position}(3.5449077) = 5 + \int_0^{3.5449077} \sin(t^2)\,dt = 5.486$$

The particle is further to the right at t=1.772.

This can also be verified by the area between the function v(t) and the t axis. Between 0<t<1.772 (portion 1)the particle is moving to the right. Then between 1.772<t<2.5066 (portion 2) the particle moves to the left but not as much as it had to the right (in portion 1) because there is less area between the axis and the function in portion 2 than portion 1. Again between 2.5066<t<3.0699 (portion 3) the particle moves to the right but again not as much as the previous portion because there is less area under the third portion than in the second portion. Between 3.0699<t<3.544 (portion 4) the particle again moves left but not as much as it had in third portion because there is less area in portion 4. Then finally between 3.5449<t<$\sqrt{5\pi}$ the particle moves to the right, but not as far to the right in this portion as it had moved left in the last portion. Therefore the furthest to the right is at time 1.772.