1) A particle travels along the x-axis so that at any time $t \geq 0$, its position is given by $x(t) = -3t^3 - 9t^2 + 24t + 2$. For what value(s) of $t$ is the velocity equal to zero?
A) $t = 4$, only
B) $t = 2$, only
C) $t = 0$ and $t = 3$
D) $t = 3$, only
E) $t = 2$ and $t = 4$

2) A particle moves on the x-axis so that its position is given by $x(t) = A \cdot 6e^t + 8$ for $t \geq 0$. For what times $t$ is the velocity of the particle increasing?
A) $t > 0$
B) $t > 3$
C) $t = 3$
D) $t < 1$
E) $t > 3$

3) The position of a particle moving on a horizontal axis for time $t$, where $t \geq 0$, is $s(t) = 3 \sin \frac{\pi}{2} t + 1$. What is the average velocity of the particle for $0 \leq t \leq \frac{3\pi}{2}$?
A) $\frac{\sqrt{3}}{2}$
B) $\frac{\sqrt{3}}{2}$
C) $\frac{3\sqrt{3}}{2}$
D) $-\frac{\sqrt{3}}{2}$
E) $-\frac{\sqrt{3}}{2}$

4) What is the maximum acceleration of a particle on the interval $0 \leq t \leq 3$ if its position is given by $s(t) = A - 4t^2$?
A) $36$
B) $-16$
C) $0$
D) $-12$
E) $24$

5) The table below shows the position of a particle, $s$, at various times, $t$, as it moves along a straight line.

<table>
<thead>
<tr>
<th>$t$ (sec)</th>
<th>1.0</th>
<th>1.4</th>
<th>1.8</th>
<th>2.2</th>
<th>2.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$s$ (ft)</td>
<td>6.0</td>
<td>7.0</td>
<td>9.0</td>
<td>15.0</td>
<td>21.0</td>
</tr>
</tbody>
</table>

What is an estimated value of the velocity of the particle at time $t = 2$?
A) $15 \text{ ft/sec}$
B) $12.5 \text{ ft/sec}$
C) $20 \text{ ft/sec}$
D) $10 \text{ ft/sec}$
E) $5 \text{ ft/sec}$

6) If the position of a particle moving on the x-axis at any time $t$ is given by $x(t) = 2t^3 - 3t$, what is the average acceleration of the particle for $0 \leq t \leq 3$?
A) $15$
B) $18$
C) $8$
D) $9$
E) $12$

7) A particle moves along the x-axis so that at any time $t \geq 0$, its position is given by $x(t) = 2t^3 - 3t$. What is the acceleration of the particle at time $t = \frac{3\pi}{2}$?
A) $-\pi^2$
B) $2$
C) $\pi$
D) $\frac{\pi^2}{3}$
E) $0$
6) A particle moves along the x-axis so that its position at any time \( t \) is given by \( x(t) = t^3 - 6t^2 + 9t + 12 \). During what times is the speed of the particle increasing? \( \dot{x}(t) \). 
A) \( t \leq 1 \) or \( 3 \leq t \) 
B) \( 1 < t < 2 \) or \( 3 < t \) 
C) \( 2 < t < 3 \) 
D) \( t < 3 \) 
E) \( t > 3 \) or \( t < 1 \)

8) A particle moves along a coordinate line so that its position is given by \( S(t) = 2 \sin \frac{1}{2}t + \frac{1}{2} \cos 2t \) for \( 0 \leq t \leq \pi \). What is the acceleration of the particle at \( t = \pi/2 \)?
A) \( -\frac{3}{2} \) 
B) \( -\frac{1}{2} \) 
C) \( 1 \) 
D) \( -\frac{5}{2} \) 
E) \( -\frac{3}{2} \)

10) A particle moves along the x-axis in such a way that its position at any time \( t \) is given by \( x(t) = A - 8B + 18t^2 + 2 \) for \( t > 0 \). At what time is the acceleration of the particle equal to 36?
A) \( 3 \) 
B) \( 4 \) 
C) \( 12 \) 
D) \( 6 \) 
E) \( 2 \)

11) A particle moves on the x-axis such that its position at any time \( t > 0 \) is given by \( x(t) = 3t^2 - 9t^2 + 2t + 12 \). What is the velocity of the particle when its acceleration is zero?
A) \( 105 \) 
B) \( 12 \) 
C) \( -3 \) 
D) \( 3 \) 
E) \( 0 \)

12) A particle moves along a horizontal axis so that its position is defined by \( S(t) = 4 \cos \frac{t}{2} \) for \( 0 \leq t \leq 5 \). What is the velocity of the particle at the time its acceleration is first equal to zero?
A) \( 2\pi \) 
B) \( -2\pi \) 
C) \( -4\pi \) 
D) \( 4\pi \) 
E) \( -\pi^2 \)

13) A particle moves along a horizontal coordinate line so that its position at time \( t \), \( 0 \leq t \leq 4 \), is given by \( S(t) = A \cdot \frac{16}{3} - 8t + 1 \). For what times \( t \) is the velocity of the particle decreasing?
A) \( \frac{2}{3} < t < 2 \) 
B) \( \frac{2}{3} < t \leq 2 \) 
C) \( 0 < t < 2 \) 
D) \( 0 < t < 4 \) 
E) \( 2 < t < 4 \)

14) The table below shows velocity of a particle at various times of a particle that moves along a horizontal line.

<table>
<thead>
<tr>
<th>( t ) (sec)</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v ) (m/sec)</td>
<td>8.3</td>
<td>9.2</td>
<td>9.8</td>
<td>10.6</td>
<td>11.0</td>
</tr>
</tbody>
</table>

What is an approximate value of the acceleration of the particle at time \( t = 2 \)?
A) \( 1.2 \) ft/sec^2 
B) \( 0.8 \) ft/sec^2 
C) \( 1.6 \) ft/sec^2 
D) \( -1.6 \) ft/sec^2 
E) \( 1.8 \) ft/sec^2