2.1 4, 12, 16, 20, 28, 29-39

4. \( f(0) = 1 \)
\( f(3) = 4 \)

Average velocity = \( \frac{4 - 1}{3 - 0} = \frac{3}{3} = 1 \text{ m/sec} \)

Distance

12. Speed is increasing.

16. \( \lim_{h \to 0} \frac{7h - 1}{h} \)

<table>
<thead>
<tr>
<th>( h )</th>
<th>( \frac{7h - 1}{h} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.01</td>
<td>1.9270</td>
</tr>
<tr>
<td>-0.001</td>
<td>1.9440</td>
</tr>
<tr>
<td>-0.0001</td>
<td>1.9457</td>
</tr>
<tr>
<td>-0.00001</td>
<td>1.9459</td>
</tr>
<tr>
<td>0.0001</td>
<td>1.945</td>
</tr>
<tr>
<td>0.001</td>
<td>1.946</td>
</tr>
<tr>
<td>0.01</td>
<td>1.964</td>
</tr>
</tbody>
</table>

\[ \approx 1.945 \]

20. The number 0 < slope at C < slope at B < slope \( \overline{AB} < 1 < \) slope at A

All the slopes are positive.

\( y = x \) has a slope of 1

28. \( \lim_{h \to 0} \frac{(3+h)^2 - (3-h)^2}{2h} = \lim_{h \to 0} \frac{9+6h+h^2 - (9-6h+h^2)}{2h} = \lim_{h \to 0} \frac{12h}{2h} = \lim_{h \to 0} 6h = 0 \)

\( = \lim_{h \to 0} 12 = [12] \)
2.1 (cont)

29. speed = |velocity|  They are the same if velocity is +.

30. \[
\lim_{h \to 0} (2+h)^2 = 4 \quad \text{yet} \quad \lim_{h \to 0} \frac{(2+h)^2 - 4}{h} \neq 0 \quad \text{since we can't take the limit of the numerator since the limit of the denominator is 0. Must do algebra.}
\]

31. The velocity at t=2 is greater than velocity at t=4

velocity is the slope of the tangent line \((T, \ell)\).

since \(f(t)\) is increasing at \(t=2\) slope is + positive

slope of \(T\) at \(t=4\) is 0 since it is a turning point.

32. \[
\begin{array}{c}
\text{distance} \\
\text{time}
\end{array}
\]

velocity < 0 when \(t < 0\)
velocity > 0 when \(t > 0\)

33. \[
\begin{array}{c}
\text{distance} \\
\text{time}
\end{array}
\]

speed \((-1) = \text{speed} \,(1)\)
velocity \((-1) \neq \text{velocity} \,(1)\)

34. Given
30 mph at 2 pm  \(\Rightarrow\) It travels between 50 and 60 mph for the whole hour
60 mph at 3 pm

false

velocity

other values could also happen.

If speed was just increasing then True
35. False, travels 80 miles in 2 hours (2pm, 4pm) only means average speed = 40 mph for those 2 hours. Not the speed at any particular time.

36. True, if the time interval is small enough.
   average velocity = instantaneous velocity

37. True, for any interval of time the average velocity will be the same. You have a constant slope so the average velocity will equal instantaneous velocity.

38. True, by definition \( \text{Average Velocity} = \frac{\text{distance traveled}}{\text{time}} \)
   So distance traveled = \( (\text{Average Velocity}) \times \text{time} \).

39. False by definition
   \[ \text{Instantaneous velocity} = \lim_{\Delta t \to 0} \frac{S(a + \Delta t) - S(a)}{\Delta t} \]
   Limit of the difference quotient.