1. Problem 2.24 in your textbook.
2. Problem 2.25 in your textbook.
3. Problem 2.27 in your textbook.
4. The freeway shown below has a 3% grade in the direction of travel shown. A driver approaching the exit at 70 mph can read the restaurant information sign when he is 135 feet from it. If the driver takes 2.5 seconds to decide to exit, and if \( a = 14.5 \text{ ft/sec}^2 \), what is his approximate speed when he reaches the exit?
\[ 200 = 1.04 \left( V_1^2 - \left( 40 \text{ mph} \times 1.47 \right)^2 \right) \frac{1}{2 \times 32.2 \times [0.95(60) + 0.015 \times 0.04]} \]

\[ V_1 = 101 \text{ ft/sec} \]

\[ V_1 = 68.7 \text{ mph} \]
1. \( V_1 = 102.67 \) mph
\( G = 0.03 \)
Stalled car @ 1000'
\( N_b = 0.90 \)

Good, dry pavement until 150' from car then wet

Where apply brakes?
\( f_{le} = 0.013; \quad g_b = 1.04; \quad W_{dry} = 1.0; \quad W_{wet} = 0.90 \)

\[
S_{dry} = \frac{g_b (V_1^2 - V_2^2)}{2g(N_bW + f_{le} + G)} = \frac{1.04 (102.67^2 - V_2^2)}{2(32.2)(1.9(0.9) + 0.013 - 0.03)}
\]

\[
S_{dry} = \frac{10962.77 - 1.04V_2^2}{56.865}
\]

\[
S_{wet} = 1.04(V_1^2 - 0) \quad \frac{2(32.2)(1.9(0.9) + 0.013 - 0.03)}
\]

\[
150 = \frac{1.04V_1^2}{51.07}
\]

\[
7660.5 = 1.04V_1^2
\]
\( V_1 = 85.82 \text{ ft/sec} \)

\[
S_{dry} = \frac{10962.77 - 1.04(85.82)^2}{56.865}
\]

\[
S_{dry} = 58.1 \text{ ft}
\]

Must apply brakes at min. of 150 + 58.1 = 208.1 ft.
\[ \frac{2 - 27}{2} = 0 \]

Sign 600 ahead

\[ V_2 = 35 \text{ mph} \]

\[ V_1 = 55 \text{ mph} \]

\[ \text{Piev} = ? \]

\[ S = \frac{V_1^2 - V_2^2}{30 \left[ \frac{a}{32.2} + G \right]} + 1.47 \text{Piev} \cdot V_1 \]

\[ 600 = \frac{55^2 - 35^2}{30 \left[ \frac{11.2}{32.2} \right]} + 1.47 \text{Piev} (55) \]

\[ 600 = 172.5 + 1.47 \text{Piev} (55) \]

\[ 427.5 = 80.85 \text{Piev} \]

\[ \text{Piev} = 5.3 \text{ sec} \]
4. \( G = +3\% \)
\[ V_1 = 70 \text{ mph} \]
Read @ 135°
\[ \text{PIEV} = 2.5 \text{ ac} \]
\[ a = 14.5 \text{ ft/sec} \]
\[ V_{\text{exit}} = ? \]

\[ \text{SSD} = \frac{V_1^2 - V_2^2}{30 \left[ \frac{a}{32.2} + G \right]} + 1.47 V_1 \text{ PIEV} \]

\[ (300 + 135) = \frac{70^2 - V_2^2}{30 \left[ \frac{14.5}{32.2} + 1.03 \right]} + 1.47 (70)(2.5) \]

\[ 177.75 = \frac{70^2 - V_2^2}{14.4} \]

\[ 2541.26 = 4900 - V_2^2 \]

\[ V_2 = 48.36 \text{ mph} \]