Lecture 30, Last Example

Please consider the last example from L30 as a NYTI problem and try it on your own first. In the following page, you will see the note shell filled out with the correct solution.
ex. A car is moving at 48 ft/sec when the brakes are applied. It decelerates at a constant rate of 6 ft/sec^2 until it stops. If \( t = 0 \) represents the time at which the brakes are applied, how far will it go before stopping?

\[ a(t) = -6 \text{ ft/sec}^2 \]

\[
\begin{align*}
\text{t = 0} & \\
V(0) &= 48 \text{ ft/sec} \\
S(0) &= 0 \\
\text{t = ?} & \\
V(t) &= 0 \\
S(t) &= ?
\end{align*}
\]

\[ a(t) = -6 \quad \rightarrow \quad V(t) = -6t + C_1 \]

\[ V(0) = 0 + C_1 = 48 \quad \rightarrow \quad C_1 = 48 \]

\[ V(t) = -6t + 48 \quad \rightarrow \quad S(t) = -3t^2 + 48t + C_2 \]

\[ S(0) = 0 + 0 + C_2 = 0 \quad \rightarrow \quad C_2 = 0 \]

\[ S(t) = -3t^2 + 48t \]

\[ \text{Car stops when } V(t) = -6t + 48 = 0 \]

\[ t = 8 \]

At that time, the stopping distance is

\[ S(8) = -3 \cdot 8^2 + 48 \cdot 8 = 192 \text{ (ft)} \]
Now You Try It (NYTI):

1. Find the function $g(x)$ if the slope of the tangent line to $g(x)$ at any $x$ is given by $\frac{(\sqrt{x} - 1)^2}{x}$ and $g(1) = 2$.

2. A car is traveling at 60 mi/hr when the brakes are fully applied, producing a constant deceleration of 22 ft/sec$^2$. What distance was traveled by the car before it comes to a stop? Be sure to change units as necessary.