Bonus Question:

$$
\begin{aligned}
y &= \sin\sqrt{2x} \\
\frac{\mathrm{d}y}{\mathrm{d}x} &= \frac{\mathrm{d}}{\mathrm{d}x}\sin\sqrt{2x} \\
&= \cos\sqrt{2x}\cdot\frac{\mathrm{d}}{\mathrm{d}x}\sqrt{2x} \\
&= \cos\sqrt{2x}\cdot\frac{1}{2}2x^{-\frac{1}{2}}\cdot\frac{\mathrm{d}}{\mathrm{d}x}2x \\
&= \cos\sqrt{2x}\cdot\frac{1}{2}2x^{-\frac{1}{2}}\cdot 2 \\
&= \cos\sqrt{2x}\cdot\frac{1}{2\sqrt{2x}}\cdot 2 \\
&= \frac{\cos\sqrt{2x}}{\sqrt{2x}}
\end{aligned}
$$