1. (35 points) Use logarithmic differentiation to evaluate \( \frac{dy}{dx} \)

\[ y = (x^2 + 5)^{\sin x} \]

2. (15 points) State whether the following statement is true or false:

\[
\lim_{x \to 1} \frac{x^2 - 3x + 2}{x^2 + 4x} = \lim_{x \to 1} \frac{2x - 3}{2x + 4}
\]

3. (15 points) State whether the following statement is true or false:

\[
\frac{d}{dx} \left( \frac{x^{1091}}{e^x} \right) = \frac{(1091 - x)x^{1090}}{e^x}
\]

Please see the other side for more problems.
4. (35 points) Differentiate the following expression using the chain rule, i.e. evaluate \( \frac{dy}{dx} \)

\[ y = \sqrt{x + \sqrt{x + \sqrt{2}}} . \]