[5]  1.) State the limit definition of the derivative: \( f'(x) = \) 

[7]  2.) Choose one of the following (clearly indicate your choice: 2A or 2B).

2A.) Prove: If \( c \) is a constant and \( f \) is differentiable at \( x \), then \( (cf)'(x) = c(f'(x)) \)

2Bi.) Define: \( f : X \rightarrow Y \) is 1:1 iff

ii.) Define: \( f : X \rightarrow Y \) is NOT 1:1 iff

iii.) Prove that \( f : R \rightarrow R, f(x) = \sqrt{x^2} \) is NOT 1:1.
3.) Suppose \( f(x) = e^x \). Evaluate the following (FILL in the blank) and graph:

a.) Graph \( y = f(x + 2) = \) 

![Graph a)

b.) Graph \( y = f(-x) = \) 

![Graph b)

c.) Graph \( y = 2f(x - 1) - 3 = \) 

![Graph c)

d.) Graph \( y = f^{-1}(x) = \) 

![Graph d)

4.) Simplify and express the given quantity as a single logarithm:

\[
[\ln(e^2 - 1) - \ln(e - 1)] \cdot [\ln(e^2)\ln(e) - \ln(1)] =
\]
5.) Let \( f(x) = \frac{\sqrt{3x^6-1}}{x^3-x^2-x+1} = \frac{\sqrt{3x^6-1}}{(x-1)^2(x+1)} \)

[5] 5a.) The domain of \( f \) is ________________________________

[5] 5b.) Show all steps: \( \lim_{x \to -\infty} f(x) = \) __________

[5] 5c.) \( \lim_{x \to +\infty} f(x) = \) __________

[4] 5d.) Does \( y = f(x) \) have any horizontal asymptotes? __________. If so, state the equation(s) of all horizontal asymptote(s):
5cont.) Recall \( f(x) = \frac{\sqrt{3x^6-1}}{x^3-x^2-x+1} = \frac{\sqrt{3x^6-1}}{(x-1)^2(x+1)} \)

[5] 5e.) \( \lim_{x \to 1} f(x) = \) 

[5] 5f.) \( \lim_{x \to -1} f(x) = \) 

[5] 5g.) \( \lim_{x \to -1^-} f(x) = \) 

[4] 5h.) Does \( y = f(x) \) have any vertical asymptotes? \( \) \( \) \( \). If so, state the equation(s) of all vertical asymptote(s):
6.) If \( f(x) = \frac{x^2 - 1}{e^{\sin x}} \), then \( f'(x) = \) _________________
7.) Find equation of tangent line to \( f(x) = \sin(4x - 3) + 2 \) at \( x = 1 \)

Answer: ________________________________

8.) If \( 3xy = \sqrt{y} + x \), then \( \frac{dy}{dx} = ________________________________ \)