

[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 $(cf)'(x) = c(f'(x))$

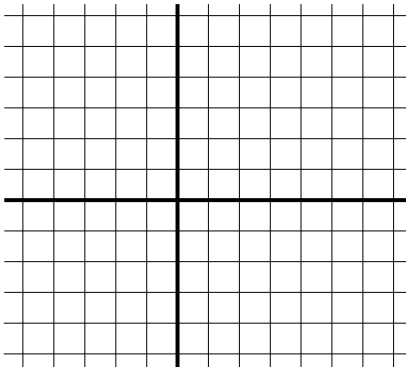
2Bi.) Define: $f : X \rightarrow Y$ is 1:1 iff

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

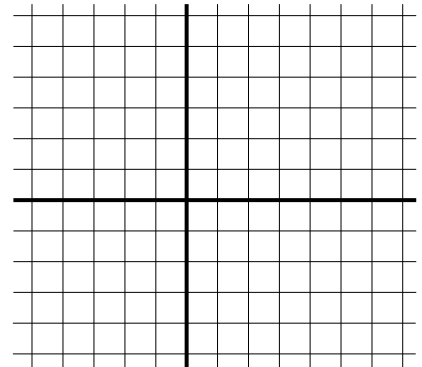
iii.) Prove that $f : R \rightarrow R$, $f(x) = \sqrt{x^2}$ is NOT 1:1.

[10] 3.) Suppose $f(x) = e^x$. Evaluate the following (FILL in the blank) and graph:

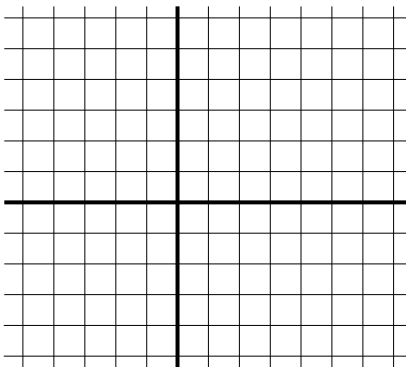
a.) Graph $y = f(x + 2) =$ _____



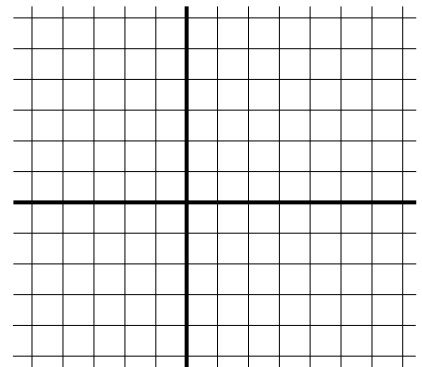
b.) Graph $y = f(-x) =$ _____



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



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



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

$$[\ln(e^2 - 1) - \ln(e - 1)] \cdot [\ln(e^2)\ln(e) - \ln(1)] = \underline{\hspace{2cm}}$$

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: $\lim_{x \rightarrow -\infty} f(x) =$ _____

[5] 5c.) $\lim_{x \rightarrow +\infty} f(x) =$ _____

[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.) $\lim_{x \rightarrow 1} f(x) =$ _____

[5] 5f.) $\lim_{x \rightarrow -1} f(x) =$ _____

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

[4] 5h.) Does $y = f(x)$ have any vertical asymptotes? _____. If so, state the equation(s) of all vertical asymptote(s):

[10] 6.) If $f(x) = \frac{x^2-1}{e^x \sin x}$, then $f'(x) =$ _____

[10] 7.) Find equation of tangent line to $f(x) = \sin(4x - 3) + 2$ at $x = 1$

Answer: _____

[10] 8.) If $3xy = \sqrt{y} + x$, then $\frac{dy}{dx} =$ _____