Midterm #1, 10/4
Math 156 (Calculus I), Fall 2022

Each problem is worth 10 points, for a total of 50 points. Remember to *show your work* on all problems!

1. Let $f(x) = \sin(\frac{x}{2}) + 1$.
   (a) Graph $f(x)$. Be sure to include some particular value labels on your x- and y-axes.
   (b) Let $g(x)$ be the function whose graph is obtained from the graph of $f(x)$ by translating to the left by π and stretching vertically by a factor of 3. Write a formula for $g(x)$.
2. Let $f(x) = 4e^{3x} - 2$. Let $g = f^{-1}$ be the inverse function of f. Write a formula for $g(x)$.
3. Let $f(x) = \dfrac{x^2 - x}{x^2 - 1}$. Compute the following limits, or if they do not exist explain why:
   (a) $\lim_{x \to 1} f(x)$
   (b) $\lim_{x \to 0} f(x)$
   (c) $\lim_{x \to -1} f(x)$
4. Describe all the horizontal and/or vertical asymptotes of the function $f(x) = 4e^{3x} - 2$. Explain your answer by saying what these asymptotes mean in terms of limits.
5. What is the slope of the line tangent to the curve $y = x^2 - 1$ at the point $(x, y) = (0, -1)$? Explain your answer, for instance sketching a graph or by discussing a limit.