

1. (10) Find $\lim_{x \rightarrow -\infty} \frac{x^2 + 1}{e^x}$.

2. (10) Find $\frac{d}{dx} 5^{4-2x}$.

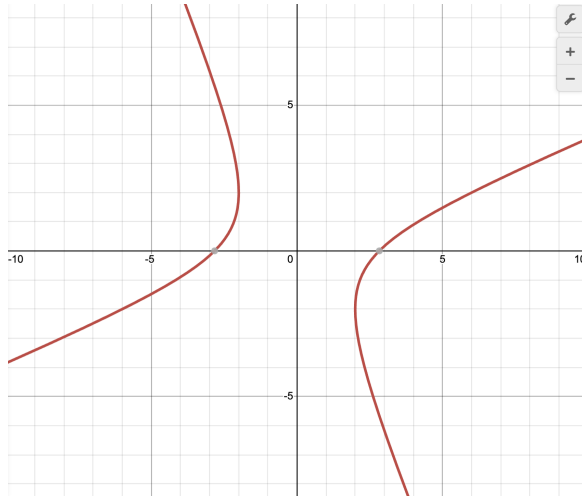
3. (10) Find $\frac{d}{dx} \log_4(1 + x^3)$.

4. (10) Find $\lim_{x \rightarrow 1^-} \frac{x^2 + 1}{x - 1}$.

5. (10) Find $\lim_{x \rightarrow \infty} \frac{\ln(x)}{x^2}$.

6. (15) Find $\frac{dy}{dx}$ if $2x^2 - xy - y = 4$.

7. (15) Consider the hyperbola $x^2 - 2xy - y^2 = 8$. Using calculus, (1) show that there are no horizontal tangents, and (2) find the points where there are vertical tangents. You are given that $\frac{dy}{dx} = \frac{x - y}{x + y}$.



8. (20) Consider the graph of $f(x) = \frac{x^2 - 4}{x^2 - 1}$. You are given that $f'(x) = \frac{6x}{(x^2 - 1)^2}$, and $f''(x) = -\frac{6(3x^2 + 1)}{(x^2 - 1)^3}$.

- (a) Determine any horizontal asymptotes.
(b) Using calculus, find all local minima and maxima.
(c) Using calculus, determine where the graph is concave up/down.

