

AP Calculus
Infinite Limits and Asymptotes
Classwork

Complete the following problems on a separate sheet of paper and show your work.

Find $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$ and identify all horizontal asymptotes.

$$1. \quad f(x) = \cos\left(\frac{1}{x}\right)$$

$$2. \quad f(x) = \frac{e^{-x}}{x}$$

$$3. \quad f(x) = \frac{3x+1}{|x|+2}$$

$$4. \quad f(x) = \frac{x}{|x|}$$

Use graphs and tables to find the limits.

$$5. \quad \lim_{x \rightarrow 2^+} \frac{1}{x-2}$$

$$6. \quad \lim_{x \rightarrow -3^-} \frac{1}{x+3}$$

$$7. \quad \lim_{x \rightarrow 0^+} \frac{\ln x}{x}$$

$$8. \quad \lim_{x \rightarrow 0^+} \csc x$$

Find the vertical asymptotes of the graphs of $f(x)$. Describe the behavior of $f(x)$ to the left and right of each vertical asymptote.

$$9. f(x) = \frac{1}{x^2 - 4}$$

$$10. f(x) = \frac{x^2 - 2x}{x + 1}$$

$$11. f(x) = \cot x$$

Find $\lim_{x \rightarrow \infty} y$ and $\lim_{x \rightarrow -\infty} y$

$$12. y = \left(2 - \frac{x}{x+1}\right) \left(\frac{x^2}{5+x^2}\right)$$

$$13. y = \frac{\cos\left(\frac{1}{x}\right)}{1 + \frac{1}{x}}$$

$$14. y = \frac{\sin x}{2x^2 + x}$$

Find a power function end behavior model function for f . Identify any horizontal asymptotes.

$$15. f(x) = 3x^2 - 2x + 1$$

$$16. f(x) = \frac{x-2}{2x^2 + 3x - 5}$$

$$17. f(x) = \frac{4x^3 - 2x + 1}{x - 2}$$