

Math 1a Fall 2004
Worksheet: Limits and Continuity

Do the following for each of the following functions. Do so algebraically; use your calculator only to check your work.

- (a) Determine the zero(s) of the function.
- (b) Determine the interval(s) on which the function is continuous.
- (c) For each discontinuity of the function, state *where* the function is discontinuous (at what x -value), state *why* the function is discontinuous, and state *what type* of discontinuity it is (removable, jump, or infinite). For the *why* question, your answer should be one of the following.
 - $f(a)$ not defined.
 - $\lim_{x \rightarrow a} f(x)$ not exist.
 - $f(a)$ is defined and $\lim_{x \rightarrow a} f(x)$ exists, but these values are not equal.
- (d) Identify any vertical asymptotes of the function and describe the function's behavior near those asymptotes.
- (e) Identify any horizontal asymptotes of the function and describe the function's behavior along those asymptotes.

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

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

3. $f(x) = \frac{1}{x} - \frac{1}{|x|}$

4. $f(x) = x^4 \cos\left(\frac{2}{x}\right)$

5. $f(x) = e^x \sin 2x$

6. $f(x) = \ln(t^4 - 1)$