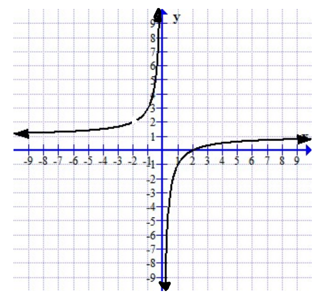
1. Sketch the function $f(x)=\dfrac{x^2-4}{x^2+2x}$ and label any asymptote(s), holes, intercepts.

$f(x)=\dfrac{(x+2)(x-2)}{x(x+2)}=\dfrac{x-2}{x}$ H.A. $y=1$ V.A. $x=0$ Hole $(-2,0)$ y-int: none x-int. $(2,0)$



a. What is the domain of this function? $(-\infty,-2)\cup(-2,0)\cup(2,\infty)$

b. Where does this function appear to be discontinuous? Why?

$x=-2$ Hole $x=0$ V.A.

c. Does a *limit exist* as *x* approaches any of the point(s) of discontinuity? Explain!

Yes, $\lim\limits_{x\to -2^-} f(x)=2=\lim\limits_{x\to -2^+} f(x) \Rightarrow \lim\limits_{x\to -2} f(x)=2$

d. List some of the criteria that you think must be met in order for a function to be continuous at a value $x = c$.

1. $f(c)$ is defined
2. $\lim\limits_{x\to c} f(x)$ exists
3. $\lim\limits_{x\to c} f(x)=f(c)$

e. Is this function continuous over its entire domain? Yes, $x=0$ and $x=-2$ are points of discontinuity but those points are not in the domain of $f(x)$.

f. Are any of the above discontinuities removable ("fixable" or "repairable")? Explain!

Yes, if you make $f(-2)=2$ the function is continuous.

2. What three conditions must be met in order for a function f to be continuous at point c?

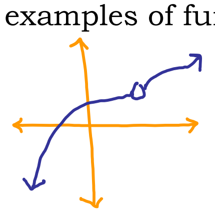
I. $f(c)$ is defined

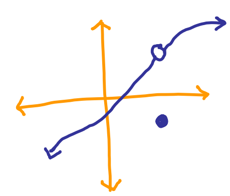
II. $\lim\limits_{x\to c} f(x)$ exists

III. $f(c)=\lim\limits_{x\to c} f(x)$

3. Define removable discontinuity. Draw two examples of functions with removable discontinuities.

A discontinuity is removable if the limit exists but the function value is undefined or not equal to the limit.





4. Define nonremovable discontinuity. Draw an example of a function with a nonremovable discontinuity.

A discontinuity is non-removable is the function fails to have a limit at that point.