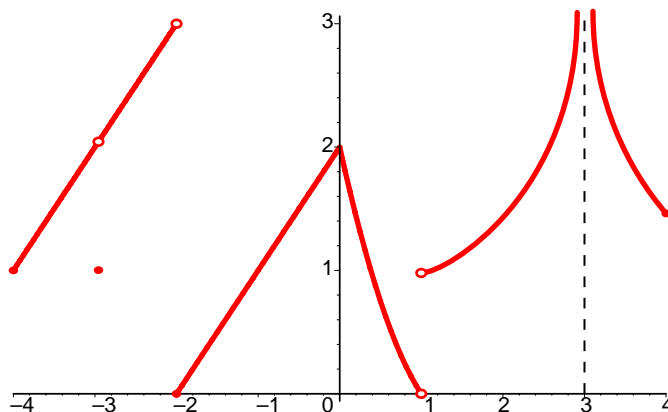


Worksheet: Section 2.5 Continuity and Discontinuities



Determine each of the following from the graph of f shown here.

Using the graph above, find all values of a , with $-4 \leq a \leq 4$, having each of the following properties.

$f(a)$ does not exist. _____

$\lim_{x \rightarrow a} f(x)$ does not exist, but a is in the domain of f . _____

$\lim_{x \rightarrow a} f(x)$ exists, and a is in the domain of f , but $\lim_{x \rightarrow a} f(x) \neq f(a)$. _____

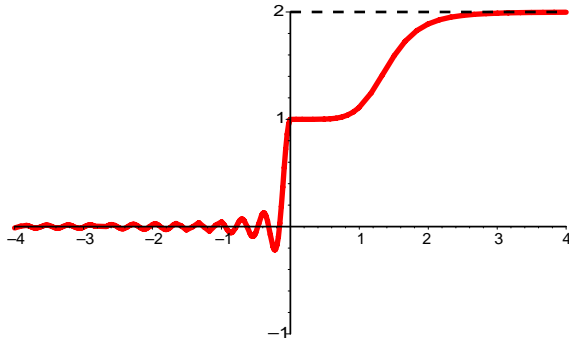
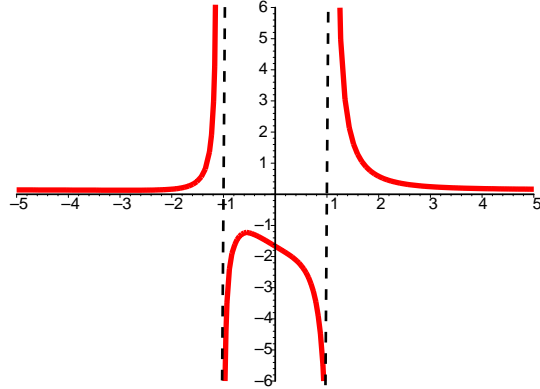
List the points at which f is not continuous, and for each, explain how f fails to be continuous.

On what intervals is the function f continuous? _____

$$g(x) = \begin{cases} x^2 + 1 & \text{if } x < -1 \\ 2x + 4 & \text{if } -1 \leq x \leq 1 \\ 2 - x & \text{if } 1 < x \end{cases}$$

List the points at which g is discontinuous, and for each, explain how g fails to be continuous. Show your work by writing out the necessary limits.

Determine the intervals on which g is continuous.

Section 2.6 Limits as $x \rightarrow \infty$ The graph of f The graph of g

Calculate each of the following.

$$\lim_{x \rightarrow -\infty} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow +\infty} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -\infty} g(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow +\infty} g(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1^-} g(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1^+} g(x) = \underline{\hspace{2cm}}$$

Write the equations for the vertical and horizontal asymptotes of each of these functions.

Calculate each of the following.

a. $\lim_{x \rightarrow \infty} \frac{1}{x^n} = \underline{\hspace{2cm}}$, where n is any positive integer.

b. $\lim_{x \rightarrow \infty} x^n = \underline{\hspace{2cm}}$, where n is any positive integer.

c. $\lim_{x \rightarrow -\infty} x^n = \underline{\hspace{2cm}}$, where n is any positive even integer.

d. $\lim_{x \rightarrow -\infty} x^n = \underline{\hspace{2cm}}$, where n is any positive odd integer.

For (e) through (k), show your work on the back.

e. $\lim_{x \rightarrow -\infty} \frac{3x^3 + 5x}{7x^3 - x^2 + 4}$

f. $\lim_{x \rightarrow -\infty} \frac{x^3 + 5x}{x^2 + 3x + 2}$

g. $\lim_{x \rightarrow -\infty} \frac{x^2 + 3x + 2}{x^3 + 5x}$

h. $\lim_{x \rightarrow +\infty} \frac{\sqrt{9x^2 - x}}{x^3 + 1}$

i. $\lim_{x \rightarrow +\infty} x^2 - x^4$

j. $\lim_{x \rightarrow +\infty} x^4 - x^2$

k. $\lim_{x \rightarrow +\infty} x - \sqrt{x}$