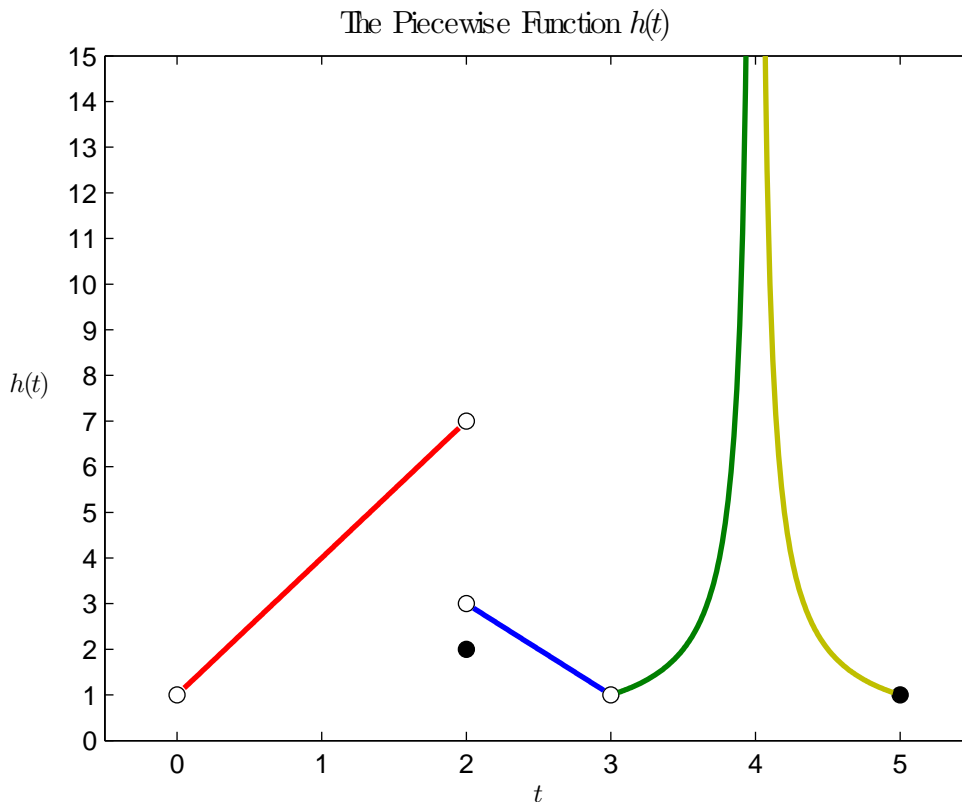


Math 2143 - Brief Calculus with Applications

Homework #3 - 2008.01.31

Due Date - 2008.02.07

Solutions



1. Place the following functions into the piecewise function definition given below.

$$h_1(t) = 2, \quad h_2(t) = -\frac{1}{t-4}, \quad h_3(t) = 7 - 2t, \quad h_4(t) = 1 + 3t, \quad h_5(t) = \frac{1}{t-4}$$

$$h(t) = \begin{cases} 1 + 3t, & 0 < t < 2 \\ 2, & t = 2 \\ 7 - 2t, & 2 < t < 3 \\ -\frac{1}{t-4}, & 3 < t < 4 \\ \frac{1}{t-4}, & 4 < t \leq 5 \end{cases} \quad \text{or} \quad h(t) = \begin{cases} h_4(t), & 0 < t < 2 \\ h_1(t), & t = 2 \\ h_3(t), & 2 < t < 3 \\ h_2(t), & 3 < t < 4 \\ h_5(t), & 4 < t \leq 5 \end{cases}$$

2. Find the values of a for which the following limits do not exist:

a) $\lim_{t \rightarrow a^-} h(t)$

The values of a for which the above limit does not exist are: $a = 0, 4$.

b) $\lim_{t \rightarrow a^+} h(t)$

The values of a for which the above limit does not exist are: $a = 4, 5$.

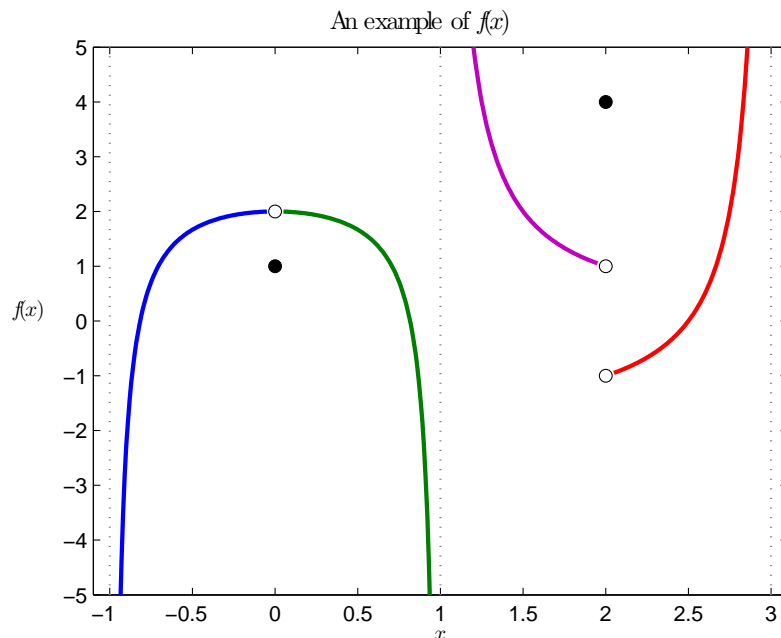
c) $\lim_{t \rightarrow a} h(t)$

The values of a for which the above limit does not exist are: $a = 0, 2, 4, 5$.

3. Sketch the graph of ONE function $f(x)$ which satisfies ALL 10 of the following conditions.

$$\begin{aligned}
 & a) \lim_{x \rightarrow 0} f(x) = 2, \quad b) f(0) = 1, \quad c) \lim_{x \rightarrow 1^-} f(x) = -\infty, \\
 & d) \lim_{x \rightarrow 1^+} f(x) = \infty, \quad e) \lim_{x \rightarrow 2^-} f(x) = 1, \quad f) \lim_{x \rightarrow 2^+} f(x) = -1, \\
 & g) f(2) = 4, \quad h) \lim_{x \rightarrow 3^-} f(x) = \infty, \quad i) \lim_{x \rightarrow -1^+} f(x) = -\infty,
 \end{aligned}$$

j) $f(x)$ is continuous at all points on the interval $(-1, 3)$ except at $x = 0$, $x = 1$ and $x = 2$.



4. Which type of discontinuity does $f(x)$ have at $x = 0$, at $x = 1$ and at $x = 2$?

There is a removable discontinuity at $x = 0$, an infinite discontinuity at $x = 1$, and a jump discontinuity at $x = 2$.