

MTH 251Z Lab

Continuity

Damien Adams

Prompts

1. Use the graph of $y = h(t)$ provided below to respond to the following prompts.

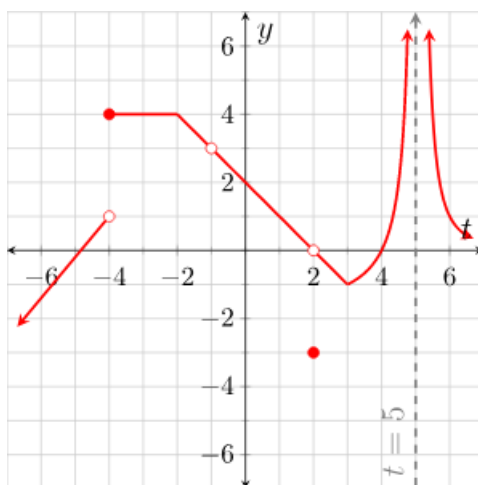


Figure 1: The graph of $y = h(t)$.

- (a) Complete the following table.

a	$h(a)$	$\lim_{t \rightarrow a^-} h(t)$	$\lim_{t \rightarrow a^+} h(t)$	$\lim_{t \rightarrow a} h(t)$
-4				
-1				
2				
3				
5				

- (b) State the value(s) of t at which the function h is discontinuous. Describe in detail why the function is discontinuous at that value.
- (c) State the value(s) of t where the function h has a removable discontinuity.
- (d) State the value(s) of t where the function h has a jump discontinuity.
- (e) State the value(s) of t where the function h has an infinite discontinuity.

2. Determine the interval(s) on which the following functions are continuous.

(a) $f(x) = 2x + 9$

(b) $g(x) = \frac{2x + 9}{x^2 - 4}$

(c) $h(x) = \sqrt{2x + 9}$

(d) $j(x) = \ln(2x + 9)$

(e) $k(x) = e^{2x+9}$

(f) $\ell(x) = \sin(2x + 9)$

(g) $m(x) = |2x + 9|$

3. Evaluate the following limits.

(a) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^2 - 3x + 2}$

(b) $\lim_{t \rightarrow 2} \frac{\sqrt{t^2 + 5} - 3}{t - 2}$

(c) $\lim_{\theta \rightarrow \pi} \sin\left(\frac{\theta}{6}\right)$

4. Sketch the graph of a function that has a jump discontinuity at $x = -2$, a removable discontinuity at $x = 1$, and an infinite discontinuity at $x = 4$.

5. Sketch the graph of a function $y = f(x)$ that has the following properties.

- $\lim_{x \rightarrow -3^-} f(x) = 2$
- $\lim_{x \rightarrow -3^+} f(x) = -1$
- $f(-3) = 0$

What kind of a discontinuity does f have at $x = -3$?

6. Let $f(x) = \begin{cases} \frac{5}{x-10} & x \leq 5 \\ \frac{5}{x-30} & 5 < x < 7 \\ \frac{x-2}{12-x} & x > 7 \end{cases}$.

For which values of x is the function f discontinuous? Justify your conclusion by showing all relevant work.