

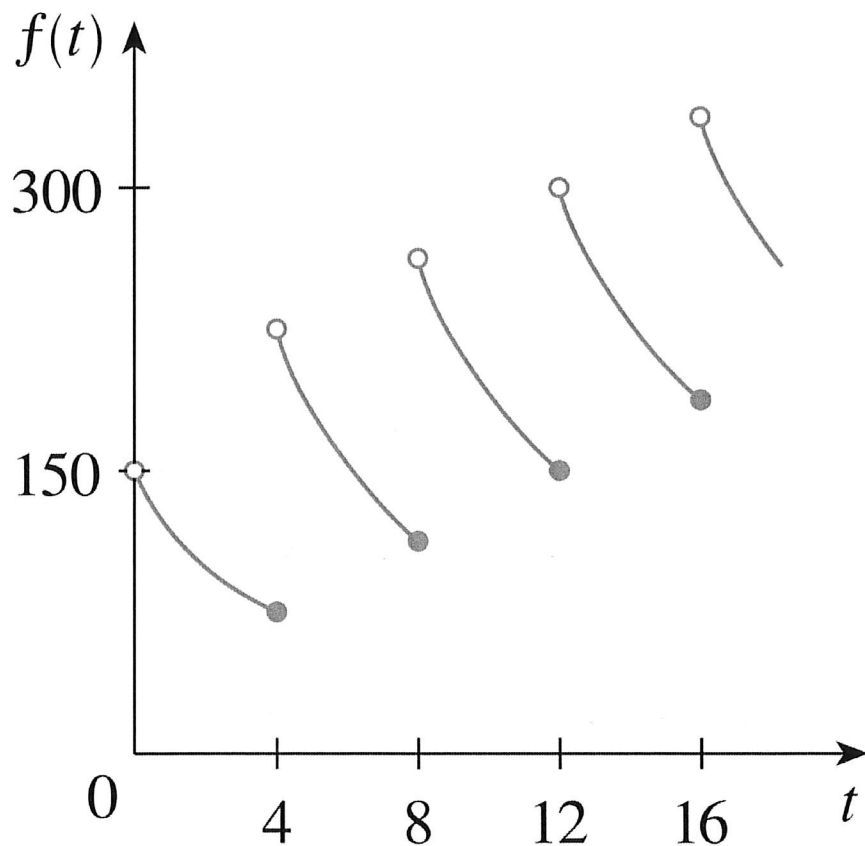
Name: SOLUTIONS .

Sec. 2.2 - Limit of a function

Math 251 – Fall 2018

Section 2.2

1. A patient receives a 150-mg injection of a drug every 4 hours. The graph shows the amount $f(t)$ of the drug in the bloodstream after t hours. Find



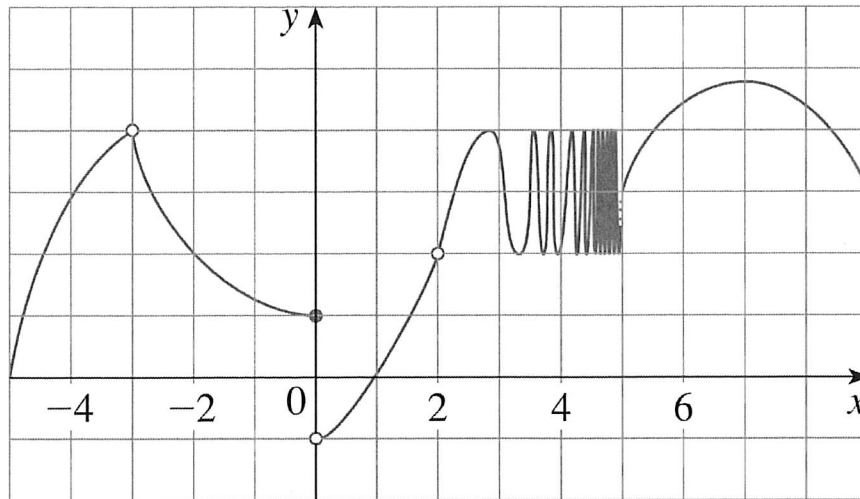
$$\lim_{t \rightarrow 12^-} f(t) \text{ and } \lim_{t \rightarrow 12^+} f(t)$$

and explain the significance of these one sided limits.

$$\lim_{t \rightarrow 12^-} f(t) = 150 \text{ mg} \quad \& \quad \lim_{t \rightarrow 12^+} f(t) = 300 \text{ mg}.$$

These limits show that there is an abrupt change in the amount of drug in the bloodstream at $t=12$ hrs. The left hand represents the amount of drug just before the 4th injection. The right hand side limit represents the amount of the drug just after the 4th injection.

2. For the function h whose graph is given, state the value of each quantity, if it exists. If it does not exist, explain why.



(a) $\lim_{x \rightarrow -3^-} h(x)$ $h(x) \rightarrow 4$ as $x \rightarrow -3^-$ so $\lim_{x \rightarrow -3^-} h(x) = 4$

(b) $\lim_{x \rightarrow -3^+} h(x)$ $h(x) \rightarrow 4$ as $x \rightarrow -3^+$, so $\lim_{x \rightarrow -3^+} h(x) = 4$

(c) $\lim_{x \rightarrow -3} h(x)$
 $\lim_{x \rightarrow -3} h(x) = 4$ because (b) & (c) are equal.

(d) $\lim_{x \rightarrow 5^-} h(x)$
 $\lim_{x \rightarrow 5^-} h(x)$ D.N.E because $h(x)$ oscillates as $x \rightarrow 5^-$

(e) $\lim_{x \rightarrow 5^+} h(x)$
 $h(x) \rightarrow 3$ as $x \rightarrow 5^+$, so $\lim_{x \rightarrow 5^+} h(x) = 3$

(f) $\lim_{x \rightarrow 5} h(x)$
 $\lim_{x \rightarrow 5} h(x)$ D.N.E because (d) \neq (e).

(g) $\lim_{x \rightarrow 0} h(x)$
 $\lim_{x \rightarrow 0} h(x)$ D.N.E because $\lim_{x \rightarrow 0^+} h(x) = -1 \neq \lim_{x \rightarrow 0^-} h(x) = 1$

3. Sketch the graph of a function such that

