1.4b Limit of a Function (continued)

1. Evaluate each limit:

   a. $\lim\limits_{x\to 3}(2x-1)$ b. $\lim\limits_{t\to -2}(3t^2-5t)$ c. $\lim\limits_{x\to 2}(-3)$ d. $\lim\limits_{x\to -2}(3^x)$ e. $\lim\limits_{x\to 1}\sqrt{\dfrac{2x+7}{5x}}$

2. Evaluate each limit. If the limit does not exist, explain why (*and it's not because the girls were mean*).

   a. $\lim\limits_{x\to -1^+}(3x-4)$ b. $\lim\limits_{x\to 2^+}\left(\dfrac{2x}{x-3}\right)$ c. $\lim\limits_{x\to 3}\left(\dfrac{2x}{x-3}\right)$ d. $\lim\limits_{x\to 0^-}\left(\dfrac{2x}{x-3}\right)$

3. Sketch the graph of each piecewise defined function and determine the indicated limit. If the limit does not exist, explain the problem:

   a. $f(x)=\begin{cases}x+1, & x<0\\ \cos(x), & x\geq 0\end{cases}$; $\lim\limits_{x\to 0}(f(x))$

   b. $g(x)=\begin{cases}(x-1)^2+2, & x\leq 1\\ 2x+1, & x>1\end{cases}$; $\lim\limits_{x\to 1}(g(x))$

   c. $p(t)=\begin{cases}6t, & t<0.5\\ 5, & t=0.5\\ \dfrac{3}{2t}, & t>0.5\end{cases}$; $\lim\limits_{t\to 0.5}(p(t))$

4. Sketch the possible graph of a function with the given characteristics:

   $\lim\limits_{x\to -1^-}(f(x))=2,\ \lim\limits_{x\to -1^+}(f(x))=1,\ f(-1)=2$

The following two problems are taken from the textbook Calculus and Vectors: Nelson, Pg. 39 #14, 15

5. Determine the real values of *a*, *b*, and *c* for the quadratic function $f(x)=ax^2+bx+c,\ a\neq 0$, that satisfy the conditions:

   $f(0)=0$, $\lim\limits_{x\to 1}(f(x))=5$, and $\lim\limits_{x\to -2}(f(x))=8$.

6. The fish population $P(t)$, in thousands, in a lake at time t, in years, is modelled by the population function:

$$P(t)=\begin{cases}3+\frac{1}{12}t^2, & 0\le t\le 6\\ 2+\frac{1}{18}t^2, & 6<t\le 12\end{cases}$$

This function describes a sudden change in the population at time $t=6$ years , due to a chemical spill.

a. Sketch the graph of $P(t)$.

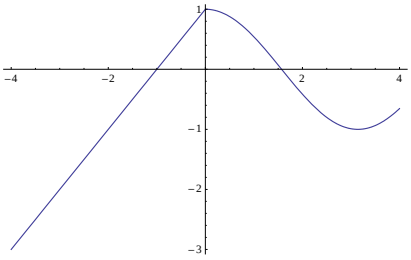
b. Evaluate $\lim\limits_{t\to 6^-}\left(P(t)\right)$ and $\lim\limits_{t\to 6^+}\left(P(t)\right)$.

c. How many fish died in the chemical spill?

d. How long after the spill did it take for the fish population to recover to the level before the spill?

Answers to Selected Problems:

1b) 22 d) $\frac{1}{9}$ 2a) -1 d) 0 3a)



$\lim\limits_{x\to 0}\left(f(x)\right)=1$

5) $a=3, b=2, c=0$