Name: _Solutions_   _____ / 25
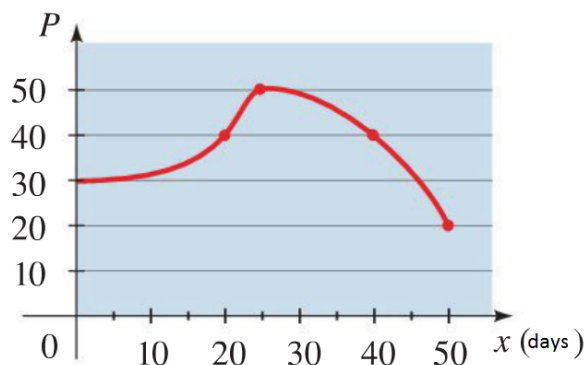
There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. **[5 points]** The graph below shows the population P of mice in a particular garden over the course of 50 days. Give answers to the following in correct units.

   a. Find the number of mice on days 25 and 40.

$$P(25) = 50 \text{ mice} \qquad P(40) = 40 \text{ mice}$$

   b. Find the average rate of change of the population from $x = 25$ to $x = 40$.

$$\frac{P(40) - P(25)}{40 - 25} = \frac{40 - 50}{40 - 25} = \frac{-10}{15} = -\frac{2}{3} \text{ mice/day}$$

   c. Find the average rate of change of the population during the entire period.

$$\frac{P(50) - P(0)}{50 - 0} = \frac{20 - 30}{50} = \frac{-10}{50} = \frac{-1}{5} \text{ mice/day}$$

2. **[6 points]** Compute the following limit. Justify your answer with a sentence or two.
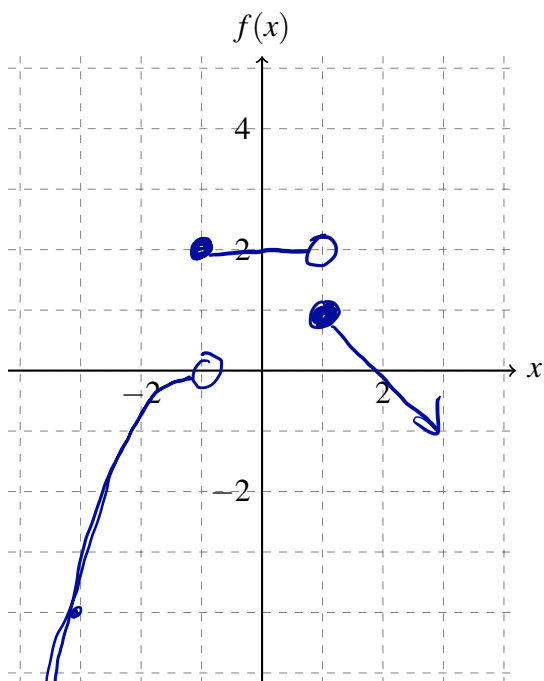
$$\lim_{x \to 2^+} \frac{(x-4)^2}{2-x} = \boxed{-\infty}$$

As $x \to 2^+$, $2-x \to 0^-$ and $(x-4)^2 \to 4$.

$$\frac{4}{0^-} = -\infty$$

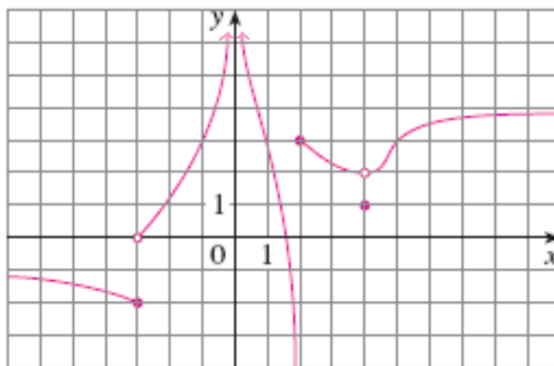**3. [5 points]** On the axes below, sketch the graph of the function

$$f(x) = \begin{cases} -x^2 & x < 0 \\ 2 & 0 \le x < 2 \\ 3 - x & x \ge 2. \end{cases}$$

Then compute the requested values in the table if they exist.

	State the value if it exists. If it does not exist state why.
$f(2) =$	1
$\displaystyle\lim_{x \to 2^-} f(x) =$	2
$\displaystyle\lim_{x \to 2} f(x) =$	DNE: $\lim\limits_{x \to 2^-} f(x) = 2$ $\lim\limits_{x \to 2^+} f(x) = 1$ $\boxed{\lim\limits_{x \to 2^-} f(x) \neq \lim\limits_{x \to 2^+} f(x)}$

4. [9 points] Use the graph of the function of $f(x)$ to answer the following questions.

a. $\displaystyle\lim_{x \to -3^-} f(x) = \underline{-2}$ **b.** $\displaystyle\lim_{x \to -3^+} f(x) = \underline{0}$ **c.** $\displaystyle\lim_{x \to -3} f(x) = \underline{DNE}$

d. $f(-1) = \underline{3}$ **e.** $f(4) = \underline{1}$ **f.** $f(-3) = \underline{-2}$

g. $\displaystyle\lim_{x \to 4} f(x) = \underline{2}$ **h.** $\displaystyle\lim_{x \to 2^-} f(x) = \underline{\infty}$ **i.** $\displaystyle\lim_{x \to -1} f(x) = \underline{3}$