

1. (7pts) Use the graph of the function to answer the following. Justify your answer if a limit does not exist.

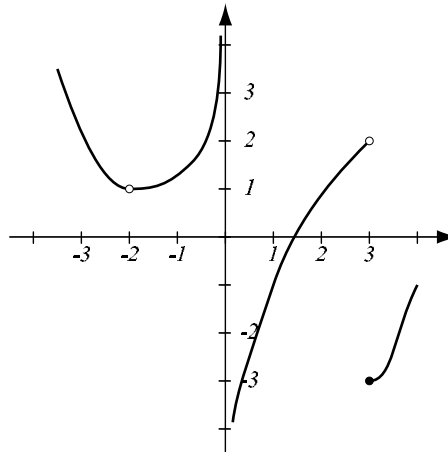
$$\lim_{x \rightarrow 3^-} f(x) =$$

$$\lim_{x \rightarrow 3^+} f(x) =$$

$$\lim_{x \rightarrow 0} f(x) =$$

$$\lim_{x \rightarrow -2} f(x) =$$

Is f continuous at $x = -2$ and why (not)?



2. (6pts) Find the following limits algebraically.

a) $\lim_{x \rightarrow 7} \frac{x^2 - 4x - 21}{x - 7} =$

b) $\lim_{x \rightarrow 3} \frac{5}{(x - 3)^2} =$

3. (9pts) This problem is about the limit $\lim_{x \rightarrow 4} \frac{3x - 12}{\sqrt{8x + 1} - \sqrt{33}}$.

a) Use your calculator to estimate the limit with three accurate decimal places. Show the table of values.

b) Find the limit algebraically and compare your answer to a).

4. (5pts) Find $\lim_{x \rightarrow 0} (x^4 + x^2) \sqrt{2 + \sin \frac{1}{x}}$. Use the theorem that rhymes with what an allergy sufferer might do.

5. (4pts) Use the Intermediate Value Theorem to show that the equation $x^4 - x^3 + x - 17 = 0$ has at least one real solution.

6. (9pts) The position of a pear thrown upward with initial velocity 9 meters per second is given by $f(t) = 9t - 5t^2$.

a) Find the instantaneous velocity of the pear at time a .

b) At what time does the pear reach the biggest height, and what is that height?

7. (5pts) Is the function $f(x)$ continuous at $x = 2$? Explain.

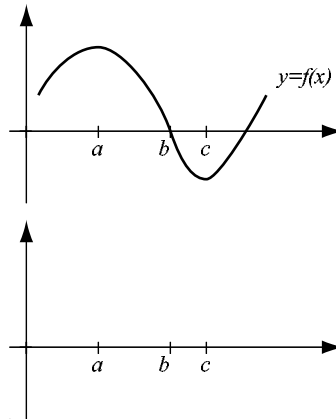
$$f(x) = \begin{cases} 3x - 2, & \text{if } x \leq 2 \\ 12 - 4x, & \text{if } 2 < x. \end{cases}$$

8. (5pts) The graph of $f(x)$ is given. Estimate the numbers below and draw the graph of $f'(x)$ under the graph of $f(x)$.

$$f'(a) =$$

$$f'(b) =$$

$$f'(c) =$$



Bonus. (5pts) Algebraically find the limit of the exponential expression

$$\lim_{x \rightarrow \infty} 2^{\frac{x^3+x+1776}{x-x^2}} =$$