

**WORKSHEET 3 ½**  
**CALCULUS I LIMITS AND CONTINUITY AT A POINT**  
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Reduce numerical results. If an answer *does not exist*, write **DNE** in the corresponding answer blank!

1. Find the following limits if they exist

A.  $\lim_{x \rightarrow 2.5} \left( \frac{2x^2 - 9x + 10}{4x^3 - 4x^2 - 25x + 25} \right)$

B.  $\lim_{x \rightarrow 2} \left( \frac{2x^2 - 9x + 10}{4x^3 - 4x^2 - 25x + 25} \right)$

C.  $\lim_{x \rightarrow 1} \left( \frac{2x^2 - 9x + 10}{4x^3 - 4x^2 - 25x + 25} \right)$

D.  $\lim_{x \rightarrow \infty} \left( \frac{2x^2 - 9x + 10}{4x^3 - 4x^2 - 25x + 25} \right)$

E.  $\lim_{x \rightarrow 3} \left( \frac{x - 3}{|x - 3|} \right)$

F.  $\lim_{x \rightarrow \infty} \left( \frac{5x^2 - 3}{(2x - 1)^2} \right)$

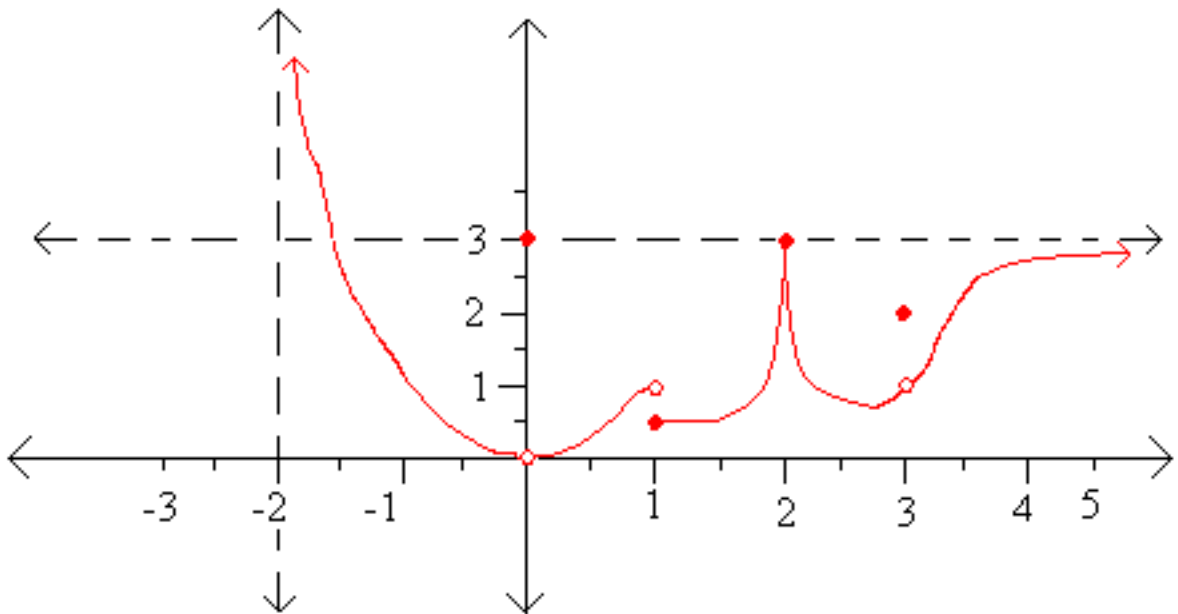
2. Consider the following function,  $f(x)$ , where  $f: (-\infty, 1) \cup (1, \infty) \rightarrow \mathbb{R}$ . Find all the  $x$  - values where  $f(x)$  is discontinuous and explain (or show) why  $f(x)$  is discontinuous at those  $x$  - values.

$$f(x) = \begin{cases} 2x - 1, & x \leq 0 \\ \frac{x^2 - x}{x - 1}, & 0 < x < 4 \\ 5, & x = 4 \\ \lceil x \rceil, & 4 < x \leq 6 \\ -x^3, & x > 6 \end{cases}$$

3. Consider the following function,  $g(x)$ , where  $g: \mathbb{R} \rightarrow \mathbb{R}$ . Find all the  $x$  - values where  $g(x)$  is discontinuous and explain (or show) why  $g(x)$  is discontinuous at those  $x$  - values.

$$g(x) = \begin{cases} 2x^2, & x \leq -3 \\ 4x - 6, & -3 < x < 0 \\ \lfloor x \rfloor, & 0 \leq x < 3 \\ x^3, & 3 < x \leq \pi \\ \sin(x), & x > \pi \end{cases}$$

4. Consider the following function,  $f(x)$ , where  $f: (-2, \infty) \rightarrow \mathbb{R}$ . Find all the  $x$ -values where the limit of  $f(x)$  does not exist and explain (or show) why the limit of  $f(x)$  does not exist at those  $x$ -values. Find all the  $x$ -values where  $f(x)$  is discontinuous and explain (or show) why  $f(x)$  is discontinuous at those  $x$ -values.



5. Consider the following function,  $h(x)$ , where  $h: (-\infty, 1) \cup (1, 2) \cup (2, \infty) \rightarrow \mathbb{R}$

$$h(x) = \left( \frac{x^3 + 3x^2 - 4x - 12}{x^2 - 3x + 2} \right)$$

Find all the  $x$ -values where the limit of  $h(x)$  does not exist and explain (or show) why the limit of  $h(x)$  does not exist at those  $x$ -values. Find all the  $x$ -values where  $h(x)$  is discontinuous and explain (or show) why  $h(x)$  is discontinuous at those  $x$ -values.