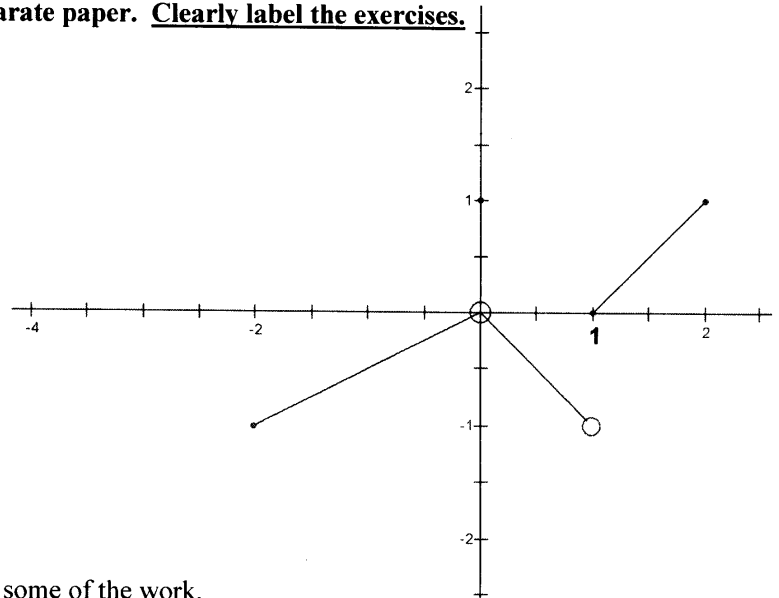# QUIZ #2 @ 25 points

Write neatly. Show all work. **Write all responses on separate paper.** <u>**Clearly label the exercises.**</u>

1.   The graph of the function $y = f(x)$ is shown.
       Find each limit (if possible).
       If a limit does not exist, explain why.

   a) $\lim\limits_{x \to 0} f(x)$

   b) $\lim\limits_{x \to 1} f(x)$

2.   Find each limit. Support your answer by showing some of the work.

   a) $\lim\limits_{x \to 1} \left(3x^4 - 2x^3 + 7x - 5 \right)$

   b) $\lim\limits_{x \to -2} \dfrac{3x^3}{3x - 1}$

   c) $\lim\limits_{x \to 2} \dfrac{x^2 - 7x + 10}{x - 2}$

   d) $\lim\limits_{x \to -3} \dfrac{2 - \sqrt{x^2 - 5}}{x + 3}$

3.   Find $\lim\limits_{h \to 0} \dfrac{f(x + h) - f(x)}{h}$ for the given values of x and function f:

   $$f(x) = x^2 \ , \quad x = 1.$$

Quiz # 2 - Solutions

① (a) $\lim\limits_{x \to 0} f(x) = \boxed{0}$

$(\lim\limits_{x \to 0^-} f(x) = \lim\limits_{x \to 0^+} f(x) = 0)$

(b) $\lim\limits_{x \to 1} f(x)$ $\boxed{\text{doesn't exist}}$

because $\lim\limits_{x \to 1^-} f(x) = -1$

$\lim\limits_{x \to 1^+} f(x) = 0$

② (a) $\lim\limits_{x \to 1} (3x^4 - 2x^3 + 7x - 5) =$

$= 3(1)^4 - 2(1)^3 + 7(1) - 5$

$= 3 - 2 + 7 - 5$

$= \boxed{3}$

(b) $\lim\limits_{x \to -2} \dfrac{3x^3}{3x-1} = \dfrac{3(-2)^3}{3(-2)-1}$

$= \dfrac{3(-8)}{-7}$

$= \dfrac{-24}{-7} = \boxed{\dfrac{24}{7}}$

(c) $\lim\limits_{x \to 2} \dfrac{x^2 - 7x + 10}{x - 2} = \left(\dfrac{0}{0}\right)$

$= \lim\limits_{x \to 2} \dfrac{\cancel{(x-2)}(x-5)}{\cancel{x-2}}$

$= \lim\limits_{x \to 2} (x-5) = 2-5 = \boxed{-3}$

(d) $\lim\limits_{x \to -3} \dfrac{2 - \sqrt{x^2 - 5}}{x + 3} = \left(\dfrac{0}{0}\right)$

$= \lim\limits_{x \to -3} \dfrac{2 - \sqrt{x^2 - 5}}{x + 3} \cdot \dfrac{2 + \sqrt{x^2 - 5}}{2 + \sqrt{x^2 - 5}}$

$= \lim\limits_{x \to -3} \dfrac{4 - (x^2 - 5)}{(x+3)(2 + \sqrt{x^2 - 5})}$

$= \lim\limits_{x \to -3} \dfrac{9 - x^2}{(x+3)(2 + \sqrt{x^2 - 5})} = \lim\limits_{x \to -3} \dfrac{(3-x)\cancel{(3+x)}}{\cancel{(x+3)}(2 + \sqrt{x^2 - 5})}$

$= \lim\limits_{x \to -3} \dfrac{3 - x}{2 + \sqrt{x^2 - 5}} = \dfrac{6}{2+2} = \dfrac{6}{4} = \boxed{\dfrac{3}{2}}$

③ $f(x) = x^2, \qquad x = 1$

$\lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h} = \lim\limits_{h \to 0} \dfrac{f(1+h) - f(1)}{h}$

$= \lim\limits_{h \to 0} \dfrac{(1+h)^2 - 1^2}{h}$

$= \lim\limits_{h \to 0} \dfrac{\cancel{1} + 2h + h^2 - \cancel{1}}{h}$

$= \lim\limits_{h \to 0} \dfrac{2h + h^2}{h}$

$= \lim\limits_{h \to 0} (2 + h) = \boxed{2}$