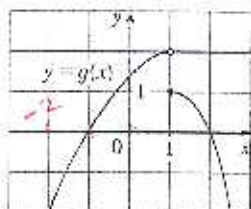
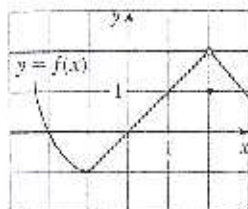


Name: Key

Date: _____

- 1) Use the Limit Laws and the Graphs of f and g in the following figure to evaluate the following limits, if they exist. (1 Pt Each)



- a) $\lim_{x \rightarrow -2} \{-2f(x) + 10g(x)\} = -2(0) + 10(-2) = -20$
 b) $\lim_{x \rightarrow 2} -2 \cdot \left\{ \frac{f(x)}{g(x)} \right\} = -2 \cdot \frac{2}{0} = \text{undefined}$
 c) $\lim_{x \rightarrow 1} \{3f(x)g(x)\} = 3(1)(\text{DNE}) = \text{DNE}$

- 2) Algebraically find the following limits. (please show all your work, you may verify your answer with your calculator, but for credit you must do this problem algebraically):

$$\lim_{t \rightarrow 7} \frac{\sqrt{t+2}-3}{t-7} \cdot \frac{\sqrt{t+2}+3}{\sqrt{t+2}+3} = \lim_{t \rightarrow 7} \frac{t+2-9}{(t-7)(\sqrt{t+2}+3)} \quad (3 \text{ Pts})$$

$$= \frac{1}{6}$$

$$\lim_{x \rightarrow -4} \frac{1 + \frac{1}{x}}{\frac{4}{4+x}} = \lim_{x \rightarrow -4} \frac{\frac{x+1}{x}}{\frac{4}{4+x}} = \frac{1}{-16} \quad (3 \text{ Pts})$$

3) Find the numbers at which the following function is discontinuous. (3 Points)

$$f(x) = \begin{cases} 5+x & \text{if } x < -1 \\ x^3 & \text{if } -1 \leq x < 1 \\ 2\|x\| & \text{if } 1 \leq x \leq 6 \end{cases}$$

Must Use Definition of Continuity

Discontinuous at $a = -1, 1, 2, 3, 4, 5, 6$

Because $\lim_{x \rightarrow a} f(x) \neq f(a)$

4) Use the Intermediate Value Theorem to show that there is a root of the following equation in the specified interval. (4 Points)

$$x^2 - \sqrt{x+1} = 0, \quad (1, 2)$$

let $f(x) = x^2 - \sqrt{x+1}$ and observe that $f(x)$ is continuous over $[1, 2]$

since $f(1) = -0.414$ and $f(2) = 2.27$ and $f(1) < 0 < f(2)$ then By I.V.T there exists a $c \in (1, 2)$ s.t $f(c) = 0$

5) Algebraically find the following limit, if it exists. (4 Points)

$$\begin{aligned} \lim_{x \rightarrow \infty} \frac{5x^2 - x - 2}{3x^2 + 4x + 1} &= \lim_{x \rightarrow \infty} \frac{\frac{5x^2}{x^2} - \frac{x}{x^2} - \frac{2}{x^2}}{\frac{3x^2}{x^2} + \frac{4x}{x^2} + \frac{1}{x^2}} \\ &= \lim_{x \rightarrow \infty} \frac{5 - \frac{1}{x} - \frac{2}{x^2}}{3 + \frac{4}{x} + \frac{1}{x^2}} = \frac{5}{3} \end{aligned}$$