## Continuity

Limits Worksheet.

Name

For each of the following determine whether f(x) is continuous by finding the appropriate right and left hand limits and graph f(x).

1. 
$$f(x) = \begin{cases} x^2 & for \ x > 2 \\ 4 & for \ x = 2 \\ x + 2 & for \ x < 2 \end{cases}$$

2. 
$$f(x) = \begin{cases} \frac{x^2 - 9}{x - 3} & \text{for } x > 3\\ 3 & \text{for } x = 3\\ \frac{2x^2 - 6x}{x - 3} & \text{for } x < 3 \end{cases}$$

$$3. \quad f(x) = \begin{cases} x^2 + 2 \text{ for } x > 1 \\ 3 \quad \text{for } x = 1 \\ 4x + 1 \text{ for } x < 1 \end{cases}$$

$$4. \quad f(x) = \begin{cases} \frac{x+5}{x^2-25} & \text{for } x > 5 \\ 0 & \text{for } x = 5 \\ x-5 & \text{for } x < 5 \end{cases}$$

For each of the following determine whether f(x) is continuous by finding the appropriate right and left hand limits.

5. 
$$f(x) = \begin{cases} \frac{x^2 - 4}{x - 2} & \text{for } x \neq 2 \\ 4 & \text{for } x = 2 \end{cases}$$

6. 
$$f(x) = \begin{cases} \frac{x^2 - 16}{x + 4} & \text{for } x \neq 4 \\ -12 & \text{for } x = 4 \end{cases}$$

7. 
$$f(x) = \begin{cases} \frac{x^3 - 27}{x - 3} & \text{for } x \neq 3 \\ 27 & \text{for } x = 3 \end{cases}$$

$$\begin{cases} \frac{x^3 + x^2 - 12x}{x^2 - 3x} & \text{for } x \neq 0, 3 \\ 4 & \text{for } x = 0 \\ 6 & \text{for } x = 3 \end{cases}$$

Answer each of the following multiple choice questions.

9) 
$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1} & \text{for } x \neq 1 \\ 4 & \text{for } x = 1 \end{cases}$$

Which of the following statement(s) are true? (there may be none!)

- A.  $\lim_{x\to i} f(x)$  exists
- B. All exists
- C. fis continuous at x = 1

10) If 
$$f(x) = \begin{cases} \frac{x^2 - x}{2x} & \text{for } x \neq 0 \\ k & \text{for } x = 0 \end{cases}$$
 and if f is continuous at  $x = 0$ , then  $k = 0$   
A.  $-1$  B.  $\frac{-1}{2}$  C. 0 D.  $\frac{1}{2}$  E. 1

Suppose 
$$f(x) = \begin{cases} \frac{3x(x-1)}{x^2 - 3x + 2} & \text{for } x \neq 1,2 \\ -3 & \text{for } x = 1 \\ 4 & \text{for } x = 2 \end{cases}$$
 then  $f(x)$  is continuous

- C. except at x = 1 or 2 B. except at x = 2A. except at x = 1.
- E. at each real number D. except at x = 0, 1, or 2

12) Suppose 
$$f(x) = \begin{cases} \frac{x^2 + x}{x} & \text{for } x \neq 0 \\ 1 & \text{for } x = 0 \end{cases}$$

Which of the following statement(s) are true of f(x)? (there may be none!)

- A. f(x) is defined at x = 0
- B.  $\lim_{x \to \infty} f(x)$  exists
- C. f(x) is continuous at x = 0