ASSIGNMENT #1

Directions: Examine each function for continuity by determining if there are any jump discontinuities, point discontinuities (holes), or vertical asymptotes. Sort the functions into one of the 4 categories below on your blue paper.

Continuous	Removable Discontinuity	Non-removable Discontinuity	Removable **and** Non-Removable Discontinuity

1. $f(x) = x \sin x$

2. $f(x) = \dfrac{1}{x}$

3. $f(x) = \dfrac{5}{x^2 + 1}$

4. $f(x) = \dfrac{x^2 - 9}{x + 3}$

5. $f(x) = \dfrac{x^3 - 1}{x^2 - 1}$

6. $f(x) = \dfrac{t}{t^2 - 1}$

7. $f(x) = \dfrac{4 - x}{x^2 - 16}$

8. $f(x) = \dfrac{x + 1}{x^2 - 4x + 3}$

9. $f(x) = \cos(x^2)$

10. $f(x) = \dfrac{x^3 + 2x}{5x}$

11. $f(x) = |8x|$

12. $f(x) = \begin{cases} x + 1, & x < 1 \\ \dfrac{1}{x}, & x \geq 1 \end{cases}$

13. $f(x) = \dfrac{x + 1}{4x - 2}$

14. $f(x) = \dfrac{x + 2}{x^2 - 3x - 10}$

15. $f(x) = \begin{cases} x^2, & x \leq 1 \\ 2 - x, & x > 1 \end{cases}$

16. $f(x) = \dfrac{|x - 10|}{x - 10}$

17. $f(x) = \dfrac{x^4 - 9x^2}{x^3 - 3x^2}$

18. $f(x) = \dfrac{x^2 - 4x}{16x - x^3}$

19. $f(x) = x^3 - 6x^2 + 5$

20. $f(x) = \dfrac{x}{x^2 - 36}$

Determine if each function is continuous at the x-value given using the 3-part definition of continuity. Use a separate sheet of paper.

1. Is *f(x)* continuous at x = 3?

$$f(x) = \begin{cases} x^2, & x < 0 \\ 2, & 0 \le x \le 3 \\ 4 - x, & x > 3 \end{cases}$$

2. Is *f(x)* continuous at x = −1?

$$f(x) = \begin{cases} 3 - x^2, & x < -1 \\ 2x, & -1 \le x \le 3 \\ 5 - x, & x > 3 \end{cases}$$

3. Is *f(x)* continuous at x = 2?

$$f(x) = \begin{cases} 2x^3 + 4, & x < 2 \\ 11x - 2, & x = 2 \\ 32 - 6x, & x > 2 \end{cases}$$

4. Is *f(x)* continuous at x = − 3?

$$f(x) = \begin{cases} 8 - x^3, & x < -3 \\ -10 + x^2, & x = -3 \\ 4x - 7, & x > -3 \end{cases}$$

5. Is *f(x)* continuous at x = 4?

$$f(x) = \begin{cases} -\sin\dfrac{\pi}{x}, & x \le 4 \\ \cos\dfrac{3\pi}{x}, & x > 4 \end{cases}$$