A.P. Calculus Test Chapter 2 Limits and Continuity Name _____

I. Multiple Choice

_____ 1. If $f(x) = \frac{x-1}{x}$ and $g(x) = 1 - x$ Then $f(g(x)) =$

(A) $\frac{-x}{1-x}$ (B) $\frac{1}{1-x}$ (C) $\frac{1-x}{x-1}$

(D) $\frac{1}{x}$ (E) $\frac{x}{1-x}$

_____ 2. For $x \neq 4$, the function h(x) is equal to $\frac{x^2 + x - 20}{x-4}$. What value should be assigned to h(4) to make h(x) continuous at x = 4?

(A) -1 (B) 0 (C) 5 (D) 9 (E) 20

_____ 3. In proving that $\lim_{x \to 10} 2x = 20$, determine the value of δ, given that $\varepsilon = 0.01$.

(A) 0.01 (B) 0.005 (C) 0.05 (D) 0.0025 (E) 0.00005

_____ 4. A bouncing ball loses $\frac{1}{4}$ of its previous height each time that it rebounds. If the ball is thrown up to a height of 60 feet, how many feet will it travel before coming to rest (including the 60 feet on the way up)?

(A) 480 (B) 240 (C) 160 (D) 120 (E) 80

_____ 5. $\lim_{x \to 6} 7 =$

(A) 1 (B) 6 (C) 7 (D) -7 (E) Does not exist

_____ 6. $\lim_{x\to 3}\frac{x}{x-3}=$

(A) 1 (B) 0 (C) $+\infty$ (D) $-\infty$ (E) Does not exist

_____ 7. Determine the points of discontinuity of $f(x)=\frac{3}{x}+\frac{2x}{x-4}$

(A) x = 0 only (B) x= -4 only (C) x = 4 only
(D) x = 0, 4 (E) No points of discontinuity

_____ 8. $\lim_{x\to\infty}\frac{x^3-2x+3}{6-4x^2-3x^3}=$

(A) $\frac{1}{3}$ (B) $\frac{1}{6}$ (C) $-\frac{1}{3}$ (D) 3 (E) Does not exist

II. Definitions

Write out complete definitions for each of the following on your own paper:

9. Limit

10. Continuity

III. Determine the limits of the following functions, showing all work on your own paper

11. $\lim_{\theta\to 0}\left(\frac{\sin(5\theta)}{\theta}\right)=$

12. $\lim_{x\to\infty}\frac{2x^2-3}{5-x}=$

13. $\lim_{x\to\infty}\frac{2x^2-3}{5-x^3}=$

14. $\lim_{x\to 3}(2x-5)=$

15. $\lim_{x\to 3}\left(\frac{2x^2-3x-9}{x-3}\right)=$

16. $\lim_{\theta\to 0}\left(\frac{\sin(6\theta)}{\sin(5\theta)}\right)=$

17. $\lim_{h\to 0}\frac{(x+h)^2-x^2}{h}=$

18. $\lim_{x\to 0}\frac{\sin^2 x}{4x^2}=$

IV. Miscellaneous

19. Given $f(x)=\begin{cases}x^2-2, & \text{if } x\le 0\\ 3x+k, & \text{if } x>0\end{cases}$

Find the value for the constant *k* that will make the function continuous at x = 0.

20. Is the function h(x) continuous at x = 0? **Prove** your answer.

$$h(x)=\begin{cases}\frac{sin(x)}{x}, & \text{when } x\neq 0\\ 2, & \text{when } x=0\end{cases}$$

21. Using the $\delta-\varepsilon$ definition of the limit, prove that $\lim_{x\to 3}(4x-5)=7$.

V. Graphs

Graph each of the following on your own paper (or graph paper):

22. Draw the graph of a function h(x) whose limit as x approaches 5 exists, but h(5) is not defined.

23. Graph $y = [x] + 2$

24. Graph $y = |x|$

25. Graph $f(x) = \begin{cases} x + 2, & x \le 3 \\ -2, & x > 3 \end{cases}$

Extra Credit (4 points)

26. Determine the limit, showing all work:

$$\lim_{x \to 2^+} \left(\frac{2 + 5x - 3x^2}{|2 - x|} \right) =$$