AP Calculus BC   Name:_____
Stewart Chapter 2 Test (Limits)
Fall 2020   Date:_____ Period:_____

Free Response Section: _NO CAS Calculator Permitted._
You have the remainder of the period to complete this section.
Once you submit your Free Response Section, you will not be allowed to revisit it.

➢ Show all of your work. Clearly label any functions, graphs, tables, or other objects that you use. Your work will be scored on the correctness and completeness of your methods as well as your answers. Answers without supporting work will usually not receive credit. To be eligible for partial credit, methods, reasoning, and conclusions should be presented clearly.

➢ Justifications require that you give mathematical (non-calculator) reasons. Students should use complete sentences in responses that include explanations or justifications.

ALL LIMITS MUST BE DETERMINED ANALYTICALLY!
No use of L'Hopital's Rule or Differentiation Rules are permitted.

1. $\lim\limits_{t \to 0} \dfrac{\sqrt{1 - \cos(t)}}{t}$

2. $\lim\limits_{x \to 0} \dfrac{\sin(x)}{2x^2 - x}$

3. $\lim\limits_{\theta \to 0} \dfrac{\csc(\theta) - \cot(\theta)}{\theta \csc(\theta)}$

4. $\lim\limits_{x \to 1} \dfrac{3x^2 + 1}{\sqrt{x^3 - 3x^2 + x + 1}}$

5. $\displaystyle\lim_{h \to 0} \frac{\sqrt{5+h} - \sqrt{5}}{h}$

6. Given that a is a constant, find the following limit:

$$\lim_{h \to 0} \frac{\dfrac{1}{a+h} - \dfrac{1}{a}}{h}$$

7. $\displaystyle\lim_{x\to 0}\frac{x\csc(x)+1}{x\csc(x)}$

8. $\displaystyle\lim_{x\to\infty}\frac{x\sin(x)+2\sin(x)}{x^2}$

9. Find the value of k that makes the function continuous at $x = 2$. Justify your reasoning using calculus.

$$f(x) = \begin{cases} kx & 0 \le x < 2 \\ 3x^2 & 2 \le x \end{cases}$$

10. Use the Intermediate Value Theorem to prove that the function $f(x) = 2e^{\cos(x)} + 1$ is equal to 5 at some point in the interval $\left[\dfrac{\pi}{2}, 2\pi\right]$