`Calculus Homework #3

1) Find $\lim_{x\to 4}\sqrt[3]{x+4}$

2) Find $\lim_{x\to -3}\frac{2}{x+2}$

3) If $\lim_{x\to c} f(x)=\frac{3}{2}$ and $\lim_{x\to c} g(x)=\frac{1}{2}$, find:

A. $\lim_{x\to c}[4f(x)]$ B. $\lim_{x\to c}[f(x)-g(x)]$ C. $\lim_{x\to c}[f(x)g(x)]$ D. $\lim_{x\to c}\frac{g(x)}{f(x)}$

4) Find $\lim_{x\to \pi}\cos(3x)$

5) Find $\lim_{x\to 7}\sec(\frac{\pi x}{6})$

6) Find $\lim_{x\to -2}\frac{x^3+8}{x+2}$, if it exists, graph the function $f(x)=\frac{x^3+8}{x+2}$ and then use this information to derive another function that agrees with $f(x)$ in all but one point.

7) Find $\lim_{x\to 1}\frac{x^2+x-2}{x^2-1}$, if it exists

8) Find $\lim_{x\to 0}\frac{\frac{1}{x+2}-\frac{1}{2}}{x}$, if it exists

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9) Use the graph of $f(x)=\dfrac{\sqrt{x+2}-\sqrt{2}}{x}$ to estimate $\lim\limits_{x\to 0} f(x)$ and then use a table of values to reinforce your conclusion from the graph. Finally, find $\lim\limits_{x\to 0}\dfrac{\sqrt{x+2}-\sqrt{2}}{x}$ exactly.

10) Find $\lim\limits_{\theta\to 0}\dfrac{\sec\theta-1}{\theta\sec\theta}$, if it exists

11) Find $\lim\limits_{\alpha\to 0}\dfrac{(1-\cos\alpha)^2}{\alpha}$, if it exists

12) Can you find $\lim\limits_{x\to 4} f(x)$ if $g(x)=-4x^2+32x-57$, $h(x)=2x^2-16x+39$, and $g(x)\le f(x)\le h(x)$? If you can, find the limit, and explain your answer including a graph.

13) Graph the function $f(x)=|x|\sin x$ and the functions $g(x)=|x|$ and $h(x)=-|x|$ all on the same graph. Use this graph to visually observe the Squeeze Theorem and then find $\lim\limits_{x\to 0}(|x|\sin x)$

14) Find $\lim\limits_{x\to 2^+}\dfrac{x}{\sqrt{x^2-4}}$, if it exists

15) Find $\lim\limits_{x\to 2} f(x)$, if it exists, if $f(x)=\begin{cases} x^2-4x+6 & \text{for } x<2 \\ -x^2+4x-2 & \text{for } x\ge 2 \end{cases}$

16) Find all values for x such that $f(x)=\dfrac{1}{x^2-16}$ is not continuous.

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17) Find all values for x such that $f(x)=\dfrac{x-3}{x^2-9}$ is not continuous, determine which, if any, of the discontinuities are removable, and then find both the left and right sided limits for every point of discontinuity.

18) Find all values for x such that $f(x)=\begin{cases}\csc(\dfrac{\pi x}{6}) & \text{for } |x-3|\le 2\\ x-3 & \text{for } x>5\\ \dfrac{-x}{3}+1 & \text{for } x<1\end{cases}$ is not continuous and determine which, if any, of the discontinuities are removable.

19) Find values for the constant c such that the function

$$f(x)=\begin{cases}\dfrac{x^2-c^2}{x-c} & \text{for } x\neq c\\ 8 & \text{for } x=c\end{cases}$$ is continuous over the real numbers.

20) If $f(x)=\dfrac{1}{x-6}$ and $g(x)=x^2+5$, are there any values of c such that $\lim\limits_{x\to c} f\circ g(x)$ would not be equal to $f\circ g(c)$?