Name ____ Date ____________________________ Period _____

Mr. Gmerek
AP Calculus
2.1 Worksheet

Evaluating Limits

Directions: Evaluate the following limits without using a calculator.

1. $\lim\limits_{x\to 3} x^2+4x-7$

$= 3^2+4(3)-7$

$\lim\limits_{x\to 3} f(x) = \boxed{14}$

2. $\lim\limits_{x\to -4} \dfrac{x+4}{x^2+12x+32}$

$\lim\limits_{x\to -4} \dfrac{(x+4)}{(x+4)(x+8)} = \lim\limits_{x\to -4} \dfrac{1}{x+8} \xrightarrow[x\to -4]{} \dfrac{1}{-4+8}$

$= \boxed{\dfrac{1}{4}}$

3. $\lim\limits_{x\to 0} \dfrac{\sqrt{x+2}-\sqrt{2}}{x}$

$\lim\limits_{x\to 0} \dfrac{\sqrt{x+2}-\sqrt{2}}{x} \cdot \dfrac{\sqrt{x+2}+\sqrt{2}}{\sqrt{x+2}+\sqrt{2}} = \lim\limits_{x\to 0} \dfrac{x+2-2}{x(\sqrt{x+2}+\sqrt{2})}$

$= \lim\limits_{x\to 0} \dfrac{1}{\sqrt{x+2}+\sqrt{2}} \xrightarrow[x\to 0]{} \boxed{\dfrac{1}{2\sqrt{2}}}$

4. $\lim\limits_{x\to 0} \dfrac{\frac{1}{x+7}-\frac{1}{7}}{x} = \lim\limits_{x\to 0} \dfrac{\frac{7}{7(x+7)} - \frac{(x+7)}{7(x+7)}}{x}$

$= \lim\limits_{x\to 0} \dfrac{\frac{7-x-7}{7(x+7)}}{x} = \lim\limits_{x\to 0} \dfrac{-x}{7(x+7)} \cdot \dfrac{1}{x} = \lim\limits_{x\to 0} -\dfrac{1}{7(x+7)}$

$\xrightarrow[x\to 0]{} \boxed{-\dfrac{1}{49}}$

5. $\lim\limits_{x\to 0} \dfrac{3\sin 5x}{10x} = \lim\limits_{x\to 0} \dfrac{3}{2} \cdot \dfrac{\sin 5x}{5x}$ $\xrightarrow[x\to 0]{} 1$

$\xrightarrow[x\to 0]{} \dfrac{3}{2} \cdot 1 = \boxed{\dfrac{3}{2}}$

6. $\lim\limits_{x\to 5} \dfrac{x^2-11x+30}{x^2-3x-10}$

$= \lim\limits_{x\to 5} \dfrac{(x-5)(x-6)}{(x-5)(x+2)}$

$= \lim\limits_{x\to 5} \dfrac{(x-6)}{x+2} \xrightarrow[x\to 5]{} \boxed{\dfrac{-1}{7}}$

7. $\lim\limits_{x\to 0} \dfrac{\tan x+7x}{x} = \lim\limits_{x\to 0} \left(\dfrac{\sin x}{x} \cdot \dfrac{1}{\cos x} + \dfrac{7x}{x}\right)$

$\xrightarrow[x\to 0]{} 1 \cdot 1 + 7 = \boxed{8}$

8. $\lim\limits_{x\to 0} x\sin\left(\dfrac{1}{x}\right)$

$-x \le x\sin\left(\frac{1}{x}\right) \le x$

$-x \xrightarrow[x\to 0]{} 0$ and $x \xrightarrow[x\to 0]{} 0$

By Sandwich Theorem

$\lim\limits_{x\to 0} x\sin\left(\frac{1}{x}\right) = \boxed{0!}$