Name: Solutions Date: Period: **Review**

Mid-Unit 1 Review – Limits

Lessons 1.1 through 1.9

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you must study all packets from Unit 1.

A salesman tracks the number of cars he sells through the model c, where $c(m)$ is number of cars sold and m is the month for $0 \le m \le 24$.

1. What does $c(10)$ represent?

   The number of cars sold in the 10th month.

2. What does $\frac{c(16)-c(8)}{16-8}$ represent?

   The average rate of change of the number of cars sold between the 8th and 16th months.

3. What does $\frac{c(7)-c(6.999)}{7-6.999}$ represent?

   An estimate of the rate of change of cars being sold (per month) on the 7th month.

Evaluate the limit.

4. $\lim_{x\to 0} \frac{\sqrt{x+19}-\sqrt{19}}{x}$

$\frac{\sqrt{x+19}-\sqrt{19}}{x} \cdot \frac{\sqrt{x+19}+\sqrt{19}}{\sqrt{x+19}+\sqrt{19}}$

$\frac{(x+19)-(19)}{x(\sqrt{x+19}+\sqrt{19})}$

$\frac{x}{x(\sqrt{x+19}+\sqrt{19})}$

$\frac{1}{\sqrt{x+19}+\sqrt{19}}$

$\boxed{\frac{1}{2\sqrt{19}}}$

5. $\lim_{x\to -3} \frac{x+3}{x^2+2x-3}$

$\frac{x+3}{(x+3)(x-1)}$

$\lim_{x\to -3} \frac{1}{x-3}$

$\boxed{-\frac{1}{4}}$

6. $\lim_{x\to 0} \frac{\sin^2(3x)}{\sin^2(5x)}$

$\lim_{x\to 0} \frac{\sin(3x)}{1} \cdot \frac{\sin(3x)}{1} \cdot \frac{1}{\sin(5x)} \cdot \frac{1}{\sin(5x)}$

$\frac{3x\sin(3x)}{3x} \quad \frac{3x\sin(3x)}{3x} \quad \frac{5x}{5x\sin(5x)} \quad \frac{5x}{5x\sin(5x)}$

$3x \cdot 3x \cdot \frac{1}{5x} \cdot \frac{1}{5x}$

$\frac{3\cdot 3}{5\cdot 5}$

$\boxed{\frac{9}{25}}$

7. $\lim_{x\to 2^-} \frac{|x-2|}{x-2}$

$\frac{|1.999-2|}{1.999-2}$

$\frac{0.001}{-0.001}$

$\boxed{-1}$

8. $\lim_{x\to 10} \frac{x^2-5x-50}{x-10}$

$\frac{(x-10)(x+5)}{x-10}$

$\lim_{x\to 10} x+5$

$\boxed{15}$

9. $\lim_{x\to 0} \frac{\frac{1}{x+1}-1}{x}$

$\lim_{x\to 0} \frac{\frac{1}{x+1}-\frac{x+1}{x+1}}{x}$

$\lim_{x\to 0} \frac{-x}{x+1} \cdot \frac{1}{x}$

$\lim_{x\to 0} \frac{-1}{x+1}$

$\boxed{-1}$

10. If $f(x) = \begin{cases} \sin x, & x < -\pi \\ \tan x & -\pi < x < \frac{\pi}{4} \\ \cos x, & x \geq \frac{\pi}{4} \end{cases}$, find the following:

a. $\lim_{x \to -\pi^-} f(x) =$ 0

b. $\lim_{x \to -\pi} f(x) =$ 0

c. $\lim_{x \to \frac{\pi}{4}} f(x) =$ DNE

d. $f\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

Give the value of each statement. If the value does not exist, write "*does not exist*" or "*undefined*."

11. $\lim_{x \to 3} f(x) =$ 2

12. $\lim_{x \to 1} f(x) =$ 4

13. $f(3) =$ DNE

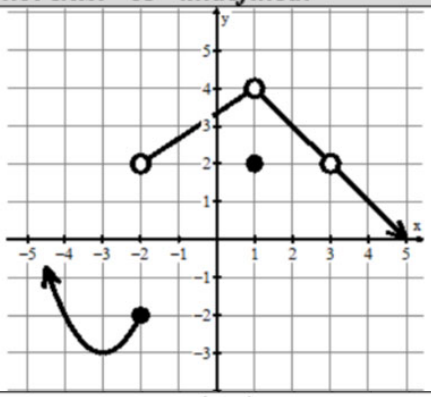
14. $f(-2) =$ -2

15. $\lim_{x \to 2} f(x) =$ 3

16. $\lim_{x \to -2^+} f(x) =$ 2

17. $f(1) =$ 2

18. $\lim_{x \to -2^-} f(x) =$ -2



19. Let g and h be the functions defined by $g(x) = -\frac{1}{4}x^2 - \frac{1}{2}x - \frac{9}{4}$ and $h(x) = \sin\left(\frac{\pi}{2}x\right) - 1$. If f is a function that satisfies $g(x) \leq f(x) \leq h(x)$ for all x, what is $\lim_{x \to -1} f(x)$?

$-\frac{1}{4}(-1)^2 - \frac{1}{2}(-1) - \frac{9}{4} \leq \lim_{x \to -1} f(x) \leq \sin\left(-\frac{\pi}{2}\right) - 1$

$-2 \leq \lim_{x \to -1} f(x) \leq -2$

-2

CALCULATOR ALLOWED:

20. If $f(x) = \frac{x^2+10x+21}{x+3}$, create your own table of values to help you evaluate $\lim_{x \to -3} f(x)$.

$\lim_{x \to -3} f(x) =$ 4

x	-3.1	-3.01	-3.001	-2.999	-2.99	-2.9
$f(x)$	3.9	3.99	3.999	4.001	4.01	4.1