Name: Answer Key Date:______________ Period: _____

Review

End of Unit 1 Review– Limits and Continuity

Lessons 1.10 through 1.16.

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you should review all packets from Unit 1 (including the Mid-Unit Review).

1. If $f(x) = \frac{x+3}{x^2-2x-15}$, identify the type of each discontinuity and where it is located.

$(x+3)(x-5)$

hole at $x=-3$
V.A. at $x=5$

State whether the function is continuous at the given x values. Justify your answers!

2. $f(x) = \begin{cases} \cos(3x), & x < 0 \\ \tan x, & 0 \le x < \frac{\pi}{4} \\ \sin(2x), & x \ge \frac{\pi}{4} \end{cases}$

Continuous at $x = 0$?

No because $\lim_{x\to 0^-} f(x) \neq \lim_{x\to 0^+} f(x)$

Continuous at $x = \frac{\pi}{4}$?

Yes. $f(\frac{\pi}{4}) = 1$ and $\lim_{x\to\frac{\pi}{4}} f(x) = f(\frac{\pi}{4})$

$\cos(0)=1$
$\tan(0)=0$
$\tan(\frac{\pi}{4})=1$
$\sin(\frac{\pi}{2})=1$

Find the domain of each function.

3. $h(t) = \frac{\sqrt{t+3}}{t-5}$

$t \ge -3$
$t \neq 5$

4. $f(x) = \ln\left(\frac{2}{x-1}\right)$

$\frac{2}{x-1} > 0$

therefore $x-1 > 0$
$x > 1$

$x-1 \neq 0$
$x \neq 1$

$x > 1$

5. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2+6x+8}{x+2}$ when $x \neq -2$, then $f(-2) =$

$\frac{\cancel{(x+2)}(x+4)}{\cancel{x+2}}$

$-2+4 = 2$

6. Let f be the function defined by $f(x) = \begin{cases} \frac{x^2+8x+12}{x+6}, & x \neq -6 \\ b, & x = -6 \end{cases}$. For what value of b is f continuous at $x = -6$?

$\frac{\cancel{(x+6)}(x+2)}{\cancel{x+6}}$

$x+2=b$

$(-6)+2=b$

$-4=b$

Evaluate the limit.

7. $\lim\limits_{x\to\infty} \sin\left(\frac{x+3\pi x^2}{2x^2}\right)$

$\sin\left(\frac{3\pi}{2}\right)$

$\boxed{-1}$

8. $\lim\limits_{x\to-5^-} \frac{-3}{25-x^2}$

$\frac{-3}{25-(-5.0001)^2}$

$\frac{-3}{-0.00001}$

$\boxed{\infty}$

9. $\lim\limits_{x\to\infty} \frac{\sin x}{x}$

$\boxed{0}$

10. $\lim\limits_{x\to\infty} \frac{4x^5-2x^2+3}{3x^2+2x^5-x^4}$

$\frac{4}{2}$

$\boxed{2}$

11. $\lim\limits_{x\to-1} \frac{x^2+1}{x+1}$

$\frac{(-1.001)^2+1}{-1.001+1}$ $\quad$ $\frac{(-0.999)^2+1}{-0.999+1}$

$\frac{2.00001}{-0.0001}$ $\quad$ $\frac{1.99999}{0.0001}$

$-\infty$ $\quad$ $\boxed{\text{DNE}}$ $\quad$ ∞

12. $\lim\limits_{x\to\infty} x^5 3^{-x}$

$\frac{x^5}{3^x}$

$\boxed{0}$

13. Identify all horizontal asymptotes of $f(x) = \frac{\sqrt{16x^6+x^3+5x}}{5x^3-8x}$.

as $x \to \infty$ $\quad$ $y = 4/5$

as $x \to -\infty$ $\quad$ $y = -4/5$