One-Sided Limits Practice

Name: _____ Date: _____

Question 1

Solve

I. $\lim_{x \to 1^+} \sqrt{\frac{x-1}{x+2}}$

II. $\lim_{x \to 1^-} \left(\frac{1}{x+1}\right)\left(\frac{x+6}{x}\right)\left(\frac{3-x}{7}\right)$

III. $\lim_{x \to 0^+} \frac{\sqrt{x^2+4x+5}-\sqrt{5}}{x}$

IV. $\lim_{x \to 0^+} \frac{1-\cos x}{|\cos x - 1|}$

$0 < x < \pi/2 \rightarrow \cos x < 1$

V. $\lim_{x \to 0^-} \frac{\cos x - 1}{|\cos x - 1|}$

$-\pi/2 < x < 0 \rightarrow \cos x < 1$

VI. $\lim_{x \to 3^+} \frac{[x]}{x}$ $\lim_{x \to 3^-} \frac{[x]}{x}$

Greatest Integer Function $y = [x]$

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Name: **Key** Date: _____

Question 1

Solve

I. $\lim_{x \to 1^+} \sqrt{\frac{x-1}{x+2}} \to \sqrt{\frac{(1)-1}{(1)+2}} \to 0$

II. $\lim_{x \to 1^-} \left(\frac{1}{x+1}\right)\left(\frac{x+6}{x}\right)\left(\frac{3-x}{7}\right) \to \left(\frac{1}{(1)+1}\right)\left(\frac{(1)+6}{(1)}\right)\left(\frac{3-(1)}{7}\right) \to 1$

III. $\lim_{x \to 0^+} \frac{\sqrt{x^2+4x+5}-\sqrt{5}}{x} \to \frac{\sqrt{x^2+4x+5}-\sqrt{5}}{x} \cdot \frac{\sqrt{x^2+4x+5}+\sqrt{5}}{\sqrt{x^2+4x+5}+\sqrt{5}}$

$\downarrow$

$\frac{x(x+4)}{x\left(\sqrt{x^2+4x+5}+\sqrt{5}\right)} \leftarrow \frac{(x^2+4x+5)-5}{x\left(\sqrt{x^2+4x+5}+\sqrt{5}\right)}$

$\downarrow$

$\frac{x+4}{\sqrt{x^2+4x+5}+\sqrt{5}} \to \frac{(0)+4}{\sqrt{(0)^2+4(0)+5}+\sqrt{5}} \to \frac{2\sqrt{5}}{5}$

IV. $\lim_{x \to 0^+} \frac{1-\cos x}{|\cos x - 1|} \to \frac{1-\cos x}{-(\cos x - 1)} \to \frac{1-\cos x}{1-\cos x} \to 1$

$0 < x < \pi/2 \to \cos x < 1$

V. $\lim_{x \to 0^-} \frac{\cos x - 1}{|\cos x - 1|} \to \frac{\cos x - 1}{-(\cos x - 1)} \to -1$

$-\pi/2 < x < 0 \to \cos x < 1$

VI. $\lim_{x \to 3^+} \frac{[x]}{x} \to \frac{3}{3} \to 1$ $\quad \lim_{x \to 3^-} \frac{[x]}{x} \to \frac{2}{3} \to \frac{2}{3}$

Greatest Integer Function $y = [x]$