Name: ___________________________________ Date: __________

AP Calculus AB Ms. Loughran

Do Now:

Evaluate.

1. $\lim_{x \to 1} \frac{x^3 + x^2 - 5x + 3}{x^3 - 3x + 2}$ $= \lim_{x \to 1} \frac{\cancel{(x-1)^2}(x+3)}{\cancel{(x-1)^2}(x+2)} = \frac{4}{3}$

denominator:

possible rational zeros: $\frac{\pm 1, \pm 2}{\pm 1} = \pm 1, \pm 2$

We knew 1 was a zero right from the beginning b/c when we plugged in 1 we got 0

plug in 1: $1^3 - 3(1) + 2 = 0$ $\therefore (x-1)$

therefore

$$\begin{array}{r|rrrr} 1 & 1 & 0 & -3 & 2 \\ & & 1 & 1 & -2 \\ \hline & 1 & 1 & -2 & 0 \end{array}$$

$x^2 + x - 2$

$(x-1)(x+2)(x-1)$

numerator:

$$\begin{array}{r|rrrr} 1 & 1 & 1 & -5 & 3 \\ & & 1 & 2 & -3 \\ \hline & 1 & 2 & -3 & 0 \end{array}$$

$x^2 + 2x - 3$

$(x-1)(x+3)(x-1)$

From Limits Review B

Limits as $x \to \pm\infty$

if the degree of the numerator < the degree of the denominator the limit = 0

19. $\lim_{x\to\infty} \frac{2x}{(x+2)^2}$ $= 0$

if the degree of the numerator > the degree of the denominator the limit is $\pm\infty$ you need to "plug" in to determine the sign

21. $\lim_{x\to\infty} \frac{4+x}{3}$ $= +\infty$

$\lim_{x\to 2^+}\left(\frac{x}{\sqrt{x^2-4}} \cdot \frac{\sqrt{x^2-4}}{\sqrt{x^2-4}}\right)$ $\lim_{x\to 2^+} \frac{x\sqrt{x^2-4}}{x^2-4}$

20. $\lim_{x\to 2^+} \frac{x}{\sqrt{x^2-4}}$

There is a vertical asymptote (VA) at $x = 2$

$+\infty$

	2	2.1
	VA	$\frac{+}{+}$

23. $\lim_{x\to\infty} \frac{3x+2}{x+1}$ $= 3$

if the degree of the numerator = the degree of the denominator the limit is the ratio of the leading coefficients

Homework 09-06

Name:________________________________ Date: ____________

AP Calc Evaluating Limits 2 Ms. Loughran

Evaluate the limit, if it exists.

1. $\lim_{x\to -3} \frac{x^2-9}{2x^2+7x+3}$ $= \frac{6}{5}$

2. $\lim_{h\to 0} \frac{(2+h)^3-8}{h}$

3. $\lim_{x\to 1} \frac{x^8-1}{x^5-x}$ $= 2$

$\frac{(\cancel{x^4-1})(x^4+1)}{x(\cancel{x^4-1})}$

4. $\lim_{x\to 9} \sqrt{x}$ $= 3$

plug in

5. $\lim_{x\to 4} \frac{x}{\sqrt{x}}$ $= 2$

6. $\lim_{x\to 0} \frac{x}{\sqrt{x}}$

$\sqrt{(x+1)^{\cancel{2}}}$

7. $\lim_{x\to -1^+} \left(\frac{x+1}{\sqrt{x+1}}\right)\cdot\left(\frac{\sqrt{x+1}}{\sqrt{x+1}}\right)$

$\lim_{x\to -1^+} \frac{(\cancel{x+1})\sqrt{x+1}}{\cancel{x+1}} = 0$

8. $\lim_{x\to 0} \frac{x-2}{\sqrt{x^2-4}}$

9. $\lim_{x\to 0} \frac{x-4}{\sqrt{x}-2}$ $= 2$

plug in

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

11. $\lim_{x\to 1} \frac{(x-1)}{(\sqrt{x^2+3}-2)} \cdot \frac{(\sqrt{x^2+3}+2)}{(\sqrt{x^2+3}+2)}$

$\lim_{x\to 1} \frac{(x-1)(\sqrt{x^2+3}+2)}{x^2+3-4} = \lim_{x\to 1} \frac{\cancel{(x-1)}(\sqrt{x^2+3}+2)}{\cancel{(x-1)}(x+1)} = \frac{4}{2} = 2$

x^2-1

12. $\lim_{x\to 1} \frac{1-\sqrt{x}}{1-x}$

13. $\lim_{x\to 1} \frac{1-\sqrt{x}}{1+x} = 0$

0

2

plug in

14. $\lim_{x\to 4} \frac{2-\sqrt{x}}{4-x}$

15. $\lim_{x\to 2} \frac{4-x^2}{3-\sqrt{x^2+5}} = 6$

$\lim_{x\to 2} \left(\frac{(4-x^2)}{(3-\sqrt{x^2+5})} \cdot \frac{(3+\sqrt{x^2+5})}{(3+\sqrt{x^2+5})} \right)$

$\lim_{x\to 2} \frac{(4-x^2)(3+\sqrt{x^2+5})}{9-(x^2+5)} = \lim_{x\to 2} \frac{\cancel{(4-x^2)}(3+\sqrt{x^2+5})}{\cancel{4-x^2}} = 6$

$9-x^2-5$

16. $\lim_{h\to 0} \frac{\sqrt{1+h}-1}{h}$

$x+2-9$

17. $\lim_{x\to 7} \frac{(\sqrt{x+2}-3)}{(x-7)} \cdot \frac{(\sqrt{x+2}+3)}{(\sqrt{x+2}+3)}$

$\lim_{x\to 7} \frac{\cancel{(x-7)}}{\cancel{(x-7)}(\sqrt{x+2}+3)} = \frac{1}{6}$

18. $\lim_{x\to -4} \frac{\frac{1}{4}+\frac{1}{x}}{4+x}$

19. $\lim_{x\to 0} \left(\frac{\frac{1}{\cancel{x+1}}-1}{x} \right) = -1$

$(x+1)$ $(x+1)$ $(x+1)$

$\cancel{1}-x\cancel{-1}$

$\lim_{x\to 0} \frac{1-(x+1)}{x(x+1)} = \lim_{x\to 0} \frac{-\cancel{x}}{\cancel{x}(x+1)} = \frac{-1}{1}$

-1

$= -1$

20. $\lim_{x \to 0} \frac{(3+x)^{-1} - 3^{-1}}{x}$

21. $\lim_{x \to 0} \frac{(5+x)^{-1} - 5^{-1}}{x} = -\frac{1}{25}$

$\lim_{x \to 0} \left(\frac{5\cancel{(5+x)}\frac{1}{\cancel{5+x}} - \frac{1}{\cancel{5}}\cancel{5}(5+x)}{x\ 5(5+x)} \right)$

$\lim_{x \to 0} \frac{\overset{5-5-x}{5-(5+x)}}{5x(5+x)} = \lim_{x \to 0} \frac{-\cancel{x}}{5\cancel{x}(5+x)} = \frac{-1}{25}$