

Calculus 1 Worksheet #5

Limits involving approaching infinity: $\lim_{x \rightarrow \infty} f(x)$

TO INFINITY AND BEYOND !!!!!

Important theorem: $\lim_{x \rightarrow \infty} \frac{1}{x} = 0$

| Limits Involving Infinity (Principle of Dominance) |
|---|
| 1. $\lim_{x \rightarrow \infty} \frac{x^a}{x^b}$, if $a < b$. Then, limit = 0. (Look for the highest degrees/powers of x) |
| 2. $\lim_{x \rightarrow \infty} \frac{Cx^a}{Dx^b}$, if $a = b$. Then, limit = $\frac{C}{D}$. (Look for the highest degrees/powers of x) |
| 3. $\lim_{x \rightarrow \infty} \frac{x^a}{x^b}$, if $a > b$. Then, limit = ∞ or $-\infty$. (Look for the highest degrees/powers of x and check the sign of ∞ by substituting with a large x-value.) |

Problems:

| | | | |
|---|--|---|--|
| 1. $\lim_{x \rightarrow \infty} 7 + \frac{1}{3x} - \frac{2}{x^2}$ | 2. $\lim_{x \rightarrow \infty} \frac{4x+8}{5x}$ | 3. $\lim_{x \rightarrow \infty} \frac{3x-1000}{x+100}$ | 4. $\lim_{x \rightarrow \infty} \frac{5x+5}{7x^2+1}$ |
| 5. $\lim_{x \rightarrow \infty} \frac{5x^2+2}{4x^2+7}$ | 6. $\lim_{x \rightarrow \infty} \frac{3x^3+5}{5x^2+1}$ | 7. $\lim_{x \rightarrow \infty} \frac{2x^2-4x}{x+1}$ | 8. $\lim_{x \rightarrow \infty} \frac{2x^2-4x}{x+1}$ |
| 9. $\lim_{x \rightarrow \infty} \frac{3x^3+2}{5x^2-1}$ | 10. $\lim_{x \rightarrow \infty} \frac{3x^2+2}{4x^2-1}$ | 11. $\lim_{x \rightarrow \infty} \frac{x^2+2}{x-555}$ | 12. $\lim_{x \rightarrow \infty} \frac{3-2x}{3x^3-1}$ |
| 13. $\lim_{x \rightarrow \infty} \frac{3-5x}{3x-1}$ | 14. $\lim_{x \rightarrow \infty} \frac{3-2x^2}{3x-1}$ | 15. $\lim_{x \rightarrow \infty} \frac{6x^2-2x-1}{2x^2+3x+2}$ | 16. $\lim_{x \rightarrow \infty} \frac{3x^3+2}{2x^2-9x^3+7}$ |
| 17. $\lim_{x \rightarrow \infty} \frac{x}{x^2-1}$ | 18. $\lim_{x \rightarrow \infty} \frac{8x^2+3x}{2x^2-1}$ | 19. $\lim_{x \rightarrow \infty} 10 - \frac{2}{x^2}$ | 20. $\lim_{x \rightarrow \infty} 4 + \frac{3}{x}$ |
| 21. $\lim_{x \rightarrow \infty} \frac{5x^2}{x+3}$ | 22. $\lim_{x \rightarrow \infty} \frac{1}{2}x - \frac{4}{x^2}$ | | |

Answers:

| | | | | | |
|--------------------|------------------|---------------|--------------------|------------------|--------------|
| 1) 7 | 2) $\frac{4}{5}$ | 3) 3 | 4) 0 | 5) $\frac{5}{4}$ | 6) $-\infty$ |
| 7) ∞ | 8) $-\infty$ | 9) ∞ | 10) $\frac{3}{4}$ | 11) ∞ | 12) 0 |
| 13) $-\frac{5}{3}$ | 14) $-\infty$ | 15) 3 | 16) $-\frac{1}{3}$ | 17) 0 | 18) 4 |
| 19) 10 | 20) 4 | 21) $-\infty$ | 22) ∞ | | |