

Exercise List For Test #2 - MTH 4424

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Name _____

1. **Prove:** $0 \leq |x| \leq r$ if and only if $-r \leq x \leq r$
2. **Prove:** For all real numbers r , $0 < r < |x|$ if and only if $x < -r$ or $r < x$
3. **Prove:** Triangle Inequality (Part #1) $|x + y| \leq |x| + |y|$
4. **Prove:** Triangle Inequality (Part #1a) $|x - y| \leq |x| + |y|$
5. **Prove:** Triangle Inequality (Part #2) $|x| - |y| \leq |x + y|$
6. **Prove:** Triangle Inequality (Part #2a) $|y| - |x| \leq |x + y|$
7. **Prove:** Triangle Inequality (Part #3) $|x| - |y| \leq |x - y|$
8. **Prove:** Triangle Inequality (Part #3a) $|y| - |x| \leq |x - y|$
9. **Prove:** Triangle Inequality (Part #4) $||x| - |y|| \leq |x + y|$
10. **Prove:** Triangle Inequality (Part #5) $||x| - |y|| \leq |x - y|$
11. **Prove:** $|ab| = |a| |b|$ for all real numbers, a and b .
12. **Prove:** $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}$ for all real numbers, a and $b \neq 0$.
13. **Prove:** $\lim_{x \rightarrow 2} (x^2 - 3x + 5) = 3$
14. **Prove:** $\lim_{x \rightarrow 1} (x^3 - 7) = -6$
15. **Prove:** $\lim_{x \rightarrow \infty} \frac{2x}{x+1} = 2$
16. **Prove:** $\lim_{x \rightarrow 1} \frac{1}{(x-1)^2} = \infty$
17. **Prove:** $\lim_{x \rightarrow 2} (x^2 + 3x - 4) = 6$
18. **Prove:** $\lim_{x \rightarrow 2} (x^3 + 4) = 12$
19. **Prove:** $\lim_{x \rightarrow 2} (x^3 - 5) = 3$

20. **Prove:** $\lim_{x \rightarrow 1} \frac{x+2}{(x-1)^2} = \infty$

21. **Prove:** $\lim_{x \rightarrow 1} \frac{x-2}{(x-1)^2} = -\infty$

22. **Prove:** $\lim_{x \rightarrow 3^+} \frac{x+2}{x-3} = \infty$

23. **Prove:** $\lim_{x \rightarrow 3^-} \frac{x+2}{x-3} = -\infty$

24. **Prove:** Prove: $\lim_{x \rightarrow \infty} \frac{3x+2}{x+5} = 3$

25. Problems similar to 13 - 24.