

Algebra 3/Trig Midterm

1. Limits as $x \rightarrow \infty$: Look for high power

a) Numerator? Limit does not exist

b) Denominator? Limit = 0

c) High powers equal? Limit = $\frac{a}{b}$ where a and b are the high power term coefficients.

2. Graphing Rational Functions: A hole appears when a zero cancels out of a rational function.

3. Factoring Patterns:

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^2 - b^2 = (a - b)(a + b)$$

$$a^2 \pm 2ab + b^2 = (a \pm b)^2$$

4. Case Problems or Domain problems: Draw a number line, with all roots labeled, and check each section when finding the domain of a square root, or the signs in each case.

5. i numbers $i = \sqrt{-1}$ $i^3 = -i$
 $i^2 = -1$ $i^4 = 1$

6. Point Slope Form: $y - y_1 = m(x - x_1)$

7. Case Problems: When solving Cases, remember to check for overlap between domain and case answer.

8. Exponents: $b^{\frac{p}{r}}$; p = power, r = root

9. Oblique Asymptotes: If the limit dne (high power in top), long divide (and ignore the remainder) to find the oblique asymptote.

10. Functions: domain = x; range = y

11. Quadratic Formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

12. Matrix Elimination: When solving using matrix elimination, the important thing is to get 0's in the corner. Don't worry about 1's on the diagonal.

13. i numbers If there is an i in a denominator, rationalize.

14. Parabolic form: $y = a(x - h)^2 + k$

15. Cramer's Rule

$$x = \frac{\begin{vmatrix} c & b \\ f & e \end{vmatrix}}{\begin{vmatrix} a & b \\ d & e \end{vmatrix}}, y = \frac{\begin{vmatrix} a & c \\ d & f \end{vmatrix}}{\begin{vmatrix} a & b \\ d & e \end{vmatrix}}$$

16. Lines: Horizontal line: slope = 0
Vertical line: no slope

17. Absolute Value Equations: If x is on the outside, (s/a $|3x - 4| = x - 3$), check your answers.

18. Case Problems: In case problems with a denominator, (s/a $\frac{|3x - 4|}{|x|} > 4$), get it out of the denominator and solve regularly.

19. Graphing Rational Functions: A graph can cross a horizontal asymptote, but cannot cross a vertical asymptote.

20. Graphing Rational Functions: A vertical asymptote is a restriction.

21. Factoring/Solving Polynomials:

1. All signs positive: All roots negative
2. Signs alternate (+ - + -) the roots are all positive.
3. Add the coefficients. If = 0, 1 is a root.
4. Change signs of odd power coefficients and add. If = 0, then -1 is a root.

22. Solving Fractional Equations: Make sure answer is not a restriction.

23. Solving Inequalities: Flip the sign when multiplying or dividing by a negative number.

24. Domain: If the problem is a radical, the number inside must be positive.