Hints Final Exam

1. Sides of a 30/60/90 Triangle are $x, x\sqrt{3}, 2x$

   Sides of a 45/45/90 triangle are $x, x, x\sqrt{2}$

2. When solving trigonometric equations (the final section of the final exam), NEVER divide both sides by a trig function.

3. Hyperbola is (-) and ellipse is a (+) between. Both have fractions in the equation.

4. Tangent formulas:

$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

5. With an ellipse, a>b and $a^2 - b^2 = c^2$

   With a hyperbola, $a^2 + b^2 = c^2$ and a is always the positive term.

6. $\sin^2 x + \cos^2 x = 1$

   $1 + \tan^2 x = \sec^2 x$

   $1 + \cot^2 x = \csc^2 x$

7. $\dfrac{(x - h)^2}{a^2} - \dfrac{(y - k)^2}{b^2} = 1$ for a horizontal traverse axis.

8. for $\sin^{-1}x, \tan^{-1} x, \csc^{-1} x$ $-\dfrac{\pi}{2} \leq y \leq \dfrac{\pi}{2}$

   for $\cos^{-1}x, \cot^{-1} x, \sec^{-1} x$ $0 \leq y \leq \pi$

9. Tangent lines are perpendicular to the radius of the circle; $m_{tan} = -\dfrac{1}{m_{rad}}$

10. $\cos 2x = \cos^2 x - \sin^2 x$

    $\sin 2x = 2\sin x \cos x$

    $\tan 2x = \dfrac{2\tan x}{1 - \tan^2 x}$

11. $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

12. Change of base rule: $\log_b M = \dfrac{\log_c M}{\log_c b}$

13. When given the slopes of the asymptotes of a hyperbola, you can find a or b by cross multiplying. For tree trunk, slope $= \pm\dfrac{b}{a}$; for happy/sad slope $= \pm\dfrac{a}{b}$

Example: Asymptotes $= \pm 2$.

$$\frac{b}{a} = \frac{2}{1} \to b = 2a \to a^2 + b^2 = c^2$$

$$a^2 + (2a)^2 = c^2$$
$$5a^2 = c^2$$

14. $central\angle = \dfrac{arc\ length}{central\ \angle}; \quad A_{sector} = \dfrac{r^2\theta}{2}$

15. $\cos 2a = 1 - 2\sin^2 A$

16. Sin is positive in the 1st and 2nd Quadrants.

17. $\log_b M^p = p\log_b M$

18. Remember that when graphing ellipses a is bigger than b. If the a is under the x then the shape (ellipse) is larger on the x axis and if the a is under the y then the shape is longer on the y axis.

19. Trig graphing: Don't forget asymptotes tan, cot, sec, csc

20. When you have crazy logs in an equation, remember to check if you can substitute one variable for the log term:

$$4(\log_{81} x)^2 + 3(\log_{81} x) - 1 = 0$$

$$4A^2 + 3A - 1 = 0$$

$$(4A - 1)(A + 1)$$

$$A = \frac{1}{4}; A = -1$$

$$\log_{81} x = \frac{1}{4}; \quad \log_{81} x = -1$$

$$x = 3; \quad x = \frac{1}{81}$$

21. for $\sin^{-1}x, \tan^{-1} x, \csc^{-1} x \ +$ in Q1; - in QIV

for $\cos^{-1}x, \cot^{-1} x, \sec^{-1} x \ \ +$ in Q1; - in QII

22. $A^{\log_A x} = x$ (make sure the "A"s match!)

22. Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Use with non-right SSS and SAS triangles

23. For inverse functions, only give 1 answer!!!! (the closest to 0)

24. If no base is given for logs, it is base 10.

25. Remember to label conic graphs completely and be careful with +/- signs in the conic formulas and identities.

26. Width points are the distance of 4c in a parabola

27. Half Angle Formulas

$$\cos\left(\frac{1}{2}A\right) = \sqrt{\frac{1+\cos A}{2}}$$

$$\sin\left(\frac{1}{2}A\right) = \sqrt{\frac{1-\cos A}{2}}$$

28. $\text{lob}_b b^x = x$;

29. $A_\Delta = \dfrac{1}{2}bc\sin A = \dfrac{1}{2}ac\sin B = \dfrac{1}{s}ab\sin C$

30. $f \circ g = f(g(x))$

   First find g(x) then find f of that number

31. $\log_x x = 1$

32. $\log_b M - \log_b N = \log_b \dfrac{M}{N}$

33. When doing inverse trig, the first step is to draw the reference triangle for the given angle, then work from there.

34.   Finding an inverse $f^{-1}(x)$ put in a y, then replace all y's with an x and all x's with a y and solve for y.

35. Evaluate a log if possible: $\log_2 16$ is 4.

36. Don't forget you can do angle addition, subtraction, half angle to find things like sin 105.