Math 135   Name _____
Sample Problems for Test 4

1. Find the inverse of the function $f(x) = 3x^3 - 7$. Be sure to show that f is 1 to 1 before you try and find the inverse (**Hint**: you'll need to sketch the graph in order to show it is 1 to 1. State any property used to determine the function is 1 to 1).

2. Expand: $\log_5\left(\dfrac{\sqrt{x}z^4}{125}\right)$

3. Number 81, section 4.4 (#77 in 7th ed.)

4. Number 84, section 4.4 (#80 in 7th ed.)

5. Number 53, section 4.2 (#49 in 7th ed.)

Solve for x in problems 6 and 7. Give answers in both exact form and (if applicable) decimal approximations rounded to two decimal places.

6. $3^{2x} = 7^{5x+2}$ 7. $\ln(1-x) + \ln(3-x) = \ln 8$

8. Use function composition to verify that $f(x) = \dfrac{5}{x-3}$ and $g(x) = \dfrac{5}{x} + 3$ are inverses.

9. Consider the graph of the function $f(x) = -2^{x-3} - 1$.

    a) What is the base function of f?
    b) Is there a reflection associated with f? If so, what axis is the reflection across?
    c) What is the vertical shift of the base graph?
    d) What is the horizontal shift of the base graph?
    e) Graph the function on the xy-plane provided to the right using transformations. Graph your base graph and all intermediate graphs using dotted curves. Sketch the final graph using a solid curve. (I should see at least two dotted curves and one solid curve)

10. A town had a population 53700 in 1996 and a population 58100 in 2000.

    a) Use the equation $N(t) = N_0 e^{kt}$ to find the exponential growth function for the town. Let 1996 represent the year $t = 0$.
    b) Use the growth function from part (a) to predict the population of the town in 2005. Found to the nearest hundred people.

11. Find the **vertex** of the parabola $y = x^2 - 4x + 5$ by completing the square. Then find the **focus** and **directrix**.

12. Determine the equation of the hyperbola with foci ($\pm 5,0$) and vertices ($\pm 2,0$)

13. Determine the **foci** of the ellipse given by $4(x-1)^2+(y-2)^2=4$. Remember to write your foci as ordered pairs.

14. Sketch the graph of $4(x-1)^2+(y-2)^2=4$.

15. The bulb in a searchlight is positioned 10 inches above the vertex of its parabolic reflector. The width of the reflector is 30 inches. Find an equation of the parabola **and** the thickness t of the reflector at its outside edge.

16. Write the following equation of the hyperbola in standard form and identify the center:
$$9x^2-4y^2+36x-8y+68=0$$

17. Convert the following equation to rectangular coordinates: $r=4\cos\theta$

18. Sketch the graph of $r=2+2\cos\theta$.