1. (a). Write in exponential form: $\log_3 81 = 4$ **(b).** Write in logarithmic form: $8^{1/3} = 2$

2. Graph the following functions(without a calculator) and clearly label 2 points.

(a). $y = 2e^x$ **(b).** $y = 3^{-x}$

3. Use properties of logarithms to expand the following logarithms as far as you can.

(a). $\log_2 x^3 y^4$ **(b).** $\log \frac{1}{\sqrt{A}}$ **(c).** $\log_b[P(1+r)^t]$

4. Use properties of logarithms to combine the following into a single logarithm.

(a). $\log x^3 - 2\log y$ **(b).** $\log_2(x-1) + \log_2(x+1) - \frac{1}{2}\log_2 x$

5. Use the change of base formula to rewrite and/or evaluate the following.

(a). $\log_7 21$ **(b).** $y = \log_2 x$

6. Solve the following equations for x. [Do parts (a) and (b) without a calculator. Give both the exact answer and decimal approximation for parts (c-e)).]

(a). $3^{5x} = 81$ **(b).** $\log_9 x = \frac{1}{2}$

(c). $120e^{-3x} + 10 = 450$ **(c).** $\ln(2x+3)^3 + 5 = 4$

(e). $\log(3x) + 2\log(x) = 4$

7. After an advertising campaign, the monthly sales for stereos at a store is given by $S = 50,000(2)^{-0.85x}$ S is the monthly sales (in dollars) and x is the number of months that have passed since the end of the advertising.

(a). What is the monthly sales right at the end of the advertising?

(b). What is the monthly sales after 3 months?

(c). When will the sales reach $2,000?

8. An initial amount of 15 g of radioactive iodine decays according to $A(t) = 15e^{-0.087t}$ where t is given in days.

(a). How much is left after 2 days?

Complete the following problems without a calculator

9. If $f(x) = x^2 - 3$, find and simplify: **(a).** $f(-1)$ **(b).** $f(2x)$

10. Graph the line $4y - 2x = 12$. Find the x and y intercepts. Clearly label them on the graph.

11. What is the slope of a line passing through the points $(-2, 5)$ and $(3, 4)$

12. Are the following two lines are parallel, perpendicular, or neither? $y = 2x - 3;$ $y = \frac{1}{2}x + \frac{1}{3}$

13. Simplify the following. Reduce fractions when possible. Use only positive exponents.

(a). -3^2

(b). $\dfrac{3 - 2 \cdot 4}{5^2}$

(c). $|7 - 2| - |2 - 7|$

(d). $x + 4 - [3a + 2x + 2(a + x + 2)]$

(e). $\dfrac{3^2}{3^{-1}3^4}$

(f). $\left(4^{-1/3}\right)^{-3/2}$

You may use a calculator on the remaining problems

14.

(a). Write the following in exponential form and simplify: $x\sqrt{x}$

(b). Write the following in radical form. Do not simplify: $2a^{3/4}$

(c). Simplify and leave your answer in radical form: $\sqrt{8x^3y^6}$

15. Expand the following: $4\,a\,(2\,a - 3\,b)^2$

16. Factor completely: **(a).** $2x^3 - 18x$ **(b).** $3x^2 - 10x + 8$

17. Solve the following equations for x: **(a).** $x^2 - 6 = x + 6$ **(b).** $3x^2 - 10x + 8 = 0$

18. Perform the indicated operations and <u>simplify</u>

(a). $\dfrac{x^2 + 3x}{x^2 - 9} \div \dfrac{3x}{x^2 - x - 6}$

(b). $\dfrac{x}{x^2 - 4} - \dfrac{4}{x + 2} + 1$

19. Solve the following equation for x: $3(2x - 5) = x + 4$

20. Given the parabola $y = -3x + x^2$

(a). Find the x and y coordinates of the vertex. **(b).** Is it a maximum or a minimum?

21. Solve the following systems of linear equations algebraically. Show all your work. If the system is dependent or inconsistent, clearly state so.

(a). $\begin{cases} -3x &+& 2y &=& -4 \\ 2x &+& 4y &=& 8 \end{cases}$

(b). $\begin{cases} x &-& 3y &=& 5 \\ -3x &+& 9y &=& -10 \end{cases}$

22. A movie theater charges \$9 for adults and \$5.50 for children. On the opening day for the latest Harry Potter movie, the theater fills all 500 of its seats. If they collected \$3870, how many children and how many adults watched the movie? Set up, **but do not solve**, the system of equations needed to determine how many children and how many adults watched the movie. Clearly indicate what x and y represent.

23. Solve the following inequality. Graph the solution on the number line. $x^2 - x - 6 \leq 0$

24. Given the system of inequalities $\begin{cases} x + 4y &\geq& 10 \\ 2x + 6y &\geq& 18 \\ x &\geq& 0 \\ y &\geq& 0 \end{cases}$

(a). Shade the feasible region **(b).** Find the corners
(c). Minimize $f = 3x + 2y$ subject to the same constraints