Note: Page 1 is a Review of the new material since Exam 3.

1. Solve the following inequality. Graph the solution on the number line. $x^2 - x - 6 \le 0$ $[-2, 3]$

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

(a). Shade the feasible region **(b).** Find the corners $(0, 3), (10, 0), (6, 1)$

(c). Minimize $f = 3x + 2y$ subject to the same constraints Minimum of 6 at $(0, 3)$.

3. (a). Write in exponential form: $\log_3 81 = 4$ $3^4 = 81$ **(b).** Write in logarithmic form: $8^{1/3} = 2$ $\log_8 2 = \frac{1}{3}$

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

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

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

(a). $\log_2 x^3 y^4 = 3 \log_2 x + 4 \log_2 y$ **(b).** $\log \frac{1}{\sqrt{A}} = -\frac{1}{2} \log A$ **(c).** $\log_b[P(1+r)^t] = \log_b P + t \log_b(1+r)$

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

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

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

(a). $\log_7 21 = \frac{\ln 21}{\ln 7} = 1.5645 \;\; OR \;\; = \frac{\log 21}{\log 7} = 1.5645$ **(b).** $y = \log_2 x = \frac{\ln x}{\ln 2} \;\; OR \;\; = \frac{\log x}{\log 2}$

8. Solve the following equations for x.

(a). $\left(\frac{1}{4}\right)^{1-x^2} = 2^{3x}$ $x = -\frac{1}{2}, 2$ **(b).** $3^{5x} = 81$ $x = \frac{4}{5}$

(c). $2^{-x} = \frac{1}{4}$ $x = 2$ **(d).** $\log_9 x = \frac{1}{2}$ $x = 3$

9. 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? $S = 50,000(2)^{-0.85 \cdot 0} = \$50,000.00$

(b). What is the monthly sales after 3 months? $S = 50,000(2)^{-0.85 \cdot 3} = \$8537.75$

10. 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? $A(2) = 12.6$ g

Note: The remaining questions are a review of material previous to exam 3.

Complete the following problems without a calculator

11. If $f(x) = x^2 - 3$, find and simplify: **(a).** $f(-1) = -2$ **(b).** $f(2x)$ $= 4x^2 - 3$

12. Graph the line $4y - 2x = 12$. Find the x and y intercepts. Clearly label them on the graph. $(0,3), (-6,0)$

13. What is the slope of a line passing through the points $(-2, 5)$ and $(3, 4)$ $m = -\frac{1}{5}$

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

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

(a). $-3^2 = -9$ **(b).** $\dfrac{3 - 2 \cdot 4}{5^2} = -\dfrac{1}{5}$ **(c).** $|7 - 2| - |2 - 7| = 0$

(d). $x + 4 - [3a + 2x + 2(a + x + 2)] = -3x - 5a$ **(e).** $\dfrac{3^2}{3^{-1}3^4} = \dfrac{1}{3}$ **(f).** $\left(4^{-1/3}\right)^{-3/2} = 2$

You may use a calculator on the remaining problems

16.

(a). Write the following in exponential form and simplify: $x\sqrt{x}$ $x^{3/2}$

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

(c). Simplify and leave your answer in radical form: $\sqrt{8x^3y^6}$ $2xy^3\sqrt{2x}$

17. Factor completely: **(a).** $2x^3 - 18x = 2x(x-3)(x+3)$ **(b).** $3x^2 - 10x + 8 = (3x-4)(x-2)$

18. Solve the following equations for x: **(a).** $x^2 - 6 = x + 6$ $x = 4, -3$ **(b).** $3x^2 - 10x + 8 = 0$ $x = 2, \frac{4}{3}$

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

(a). $\dfrac{x^2 + 3x}{x^2 - 9} \div \dfrac{3x}{x^2 - x - 6}$ $= \dfrac{x+2}{3}$ **(b).** $\dfrac{x}{x^2-4} - \dfrac{4}{x+2} + 1$ $= \dfrac{x^2 - 3x + 4}{x^2 - 4}$

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

(a). Find the x and y coordinates of the vertex. $(\frac{3}{2}, -\frac{9}{4})$ **(b).** Is it a maximum or a minimum?   min.

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

(a). $\begin{cases} -3x &+ &2y &= &-4 \\ 2x &+ &4y &= &8 \end{cases}$ $x = 2, y = 1$ **(b).** $\begin{cases} x &- &3y &= &5 \\ -3x &+ &9y &= &-10 \end{cases}$ Inconsistent; No Solution

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?

<u>Set up, **but do not solve**</u>, the system of equations needed to determine how many children and how many adults watched the movie. Clearly indicate what x and y represent.

Let x = number of adults and y = number of children. Then $\begin{cases} x &+ &y &= &500 \\ 9x &+ &5.50y &= &3870 \end{cases}$