

Note: The first part of this review is of the new material since Exam 3.

1. (a). Write in exponential form: $\log_3 81 = 4$ $3^4 = 81$ (b). Write in logarithmic form: $8^{1/3} = 2$ $\log_8 2 = \frac{1}{3}$
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). $\log_2 x^3 y^4 = 3 \log_2 x + 4 \log_2 y$ (b). $\log \frac{1}{\sqrt{A}} = -\frac{1}{2} \log A$ (c). $\log_b [P(1+r)^t] = \log_b P + t \log_b (1+r)$
4. 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). $\log_2(x-1) + \log_2(x+1) - \frac{1}{2} \log_2 x = \log_2 \frac{x^2 - 1}{\sqrt{x}}$
5. 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 $= \frac{\log x}{\log 2}$
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). $3^{5x} = 81$ $x = \frac{4}{5}$ (b). $\log_9 x = \frac{1}{2}$ $x = 3$
 (c). $120e^{-3x} + 10 = 450$ $\frac{\ln(11/3)}{-3} \approx -0.4331$ (c). $\ln(2x+3)^3 + 5 = 4$ $\frac{e^{-1/3} - 3}{2} \approx -1.1417$
 (e). $\log(3x) + 2 \log(x) = 4$ $\left(\frac{10000}{3}\right)^{1/3} \approx 14.938$
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? $S = 50,000(2)^{-0.85 \cdot 0} = \$50,000.00$
 (b). What is the monthly sales after 3 months? $S = 50,000(2)^{-0.85 \cdot 3} = \8537.75
 (c). When will the sales reach \$2,000? 5.46 months
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? $A(2) = 12.6$ g

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

Complete the following problems without a calculator

9. If $f(x) = x^2 - 3$, find and simplify: (a). $f(-1) = -2$ (b). $f(2x) = 4x^2 - 3$
10. Graph the line $4y - 2x = 12$. Find the x and y intercepts. Clearly label them on the graph. $(0, 3), (-6, 0)$
11. What is the slope of a line passing through the points $(-2, 5)$ and $(3, 4)$ $m = -\frac{1}{5}$
12. Are the following two lines parallel, perpendicular, or neither? $y = 2x - 3$; $y = \frac{1}{2}x + \frac{1}{3}$ neither

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

(a). $-3^2 = -9$

(b). $\frac{3 - 2 \cdot 4}{5^2} = -\frac{1}{5}$

(c). $|7 - 2| - |2 - 7| = 0$

(d). $x + 4 - [3a + 2x + 2(a + x + 2)] = -3x - 5a$

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

(f). $(4^{-1/3})^{-3/2} = 2$

You may use a calculator on the remaining problems

14.

(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: $\sqrt{8x^3y^6}$

$2xy^3\sqrt{2x}$

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

$16a^3 - 48a^2b + 36ab^2$

16. Factor completely:

(a). $2x^3 - 18x = 2x(x - 3)(x + 3)$

(b). $3x^2 - 10x + 8 = (3x - 4)(x - 2)$

17. Solve the following equations for x : (a). $x^2 - 6 = x + 6$

$x = 4, -3$

(b). $3x^2 - 10x + 8 = 0$

$x = 2, \frac{4}{3}$

18. Perform the indicated operations and simplify

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

(b). $\frac{x}{x^2 - 4} - \frac{4}{x + 2} + 1 = \frac{x^2 - 3x + 4}{x^2 - 4}$

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

$\frac{19}{5}$

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). $\begin{cases} -3x + 2y = -4 \\ 2x + 4y = 8 \end{cases} \quad x = 2, y = 1$

(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?

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.

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

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

[-2, 3]

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

(0, 3), (10, 0), (6, 1)

(c). Minimize $f = 3x + 2y$ subject to the same constraints

Minimum of 6 at (0, 3).