

EXPONENTS AND LOGARITHMS

Name:

Date:

My Achievement Goal for this chapter is... (Circle one)

A+ A B C D

This Assignment is:

Good to Go

Needs Corrections

Please answer all questions on this sheet and remember to show all your work!

- Convert $b^a = c$ to a logarithmic form.
- Simplify or evaluate the following:
 - $\log_2 8$
 - $\log_{\frac{1}{3}} 243^x$
 - $\ln(\sqrt[4]{e})$
 - $\beta^{2 \log_{\beta} x - \log_{\beta} y}$
- Solve $\left(\frac{1}{5}\right)^{x+3} = 125^{2x-36}$ for x without using logarithms.
- If $\ln x = 5$ and $\ln y = 7$, then $\ln(xy^4)$?

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5. The population of a town in Alberta is decreasing at the rate of $k\%$ per year. The current population (in millions) is 4.15.
- If k is 5, write an equation which can be used to calculate the final population A at a certain time t .
 - Give the same equation as in part a using $k = 10$.
 - Sketch both equations on the space provided below. Make sure to indicate the correct x and y ticks and also label the y - intercept.
6. The exponential decay function $A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{P}}$ can be used to determine the amount A , of a radioactive substance present at time t , if A_0 represents the initial amount and P represents the half-life of the substance.
- If a substance loses 70% of its radioactivity in 500 days, determine the period of the half-life P .

- You can also convert the half life function $A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{P}}$ as another function of the form

$$A = A_0 e^{kt},$$

where, k is a constant of proportionality. Find the correct k so that this conversion can be performed successfully.

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7. James, who is an university student, borrowed a student loan of \$50,000. What is his total payment after 10 years if the interest was charged at the rate of 5% per annum compounded:
- semi-annually.
 - monthly.
 - continuously.
 - Which method is the best choice for James? Why?

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8. A student is attempting to solve the equation

$$\log_2(2 - 3x) - (\log_2(x + 1) + \log_2 2x) = \log_2 4.$$

| Line # | Student's work |
|--------|--|
| 1 | $\log_2 \frac{2 - 3x}{x + 1} + \log_2 2x = \log_2 2^2$ |
| 2 | $\log_2 \left(\frac{2x(2 - 3x)}{x + 1} \right) = 2$ |
| 3 | $2^2 = \frac{2x(2 - 3x)}{x + 1}$ |
| 4 | $4x + 4 = 4x - 6x^2$ |
| 5 | $6x^2 = -4$ |
| 6 | No Solutions. |

Is the student's solution correct? If not, find the line where the student made a mistake and rewrite the correct solution.

9. Consider the equation $15(2)^x = 84$.

a. By using a calculator, give an approximated value of x . (Round to one decimal place.)

b. Find the exact value of x involving logarithms.

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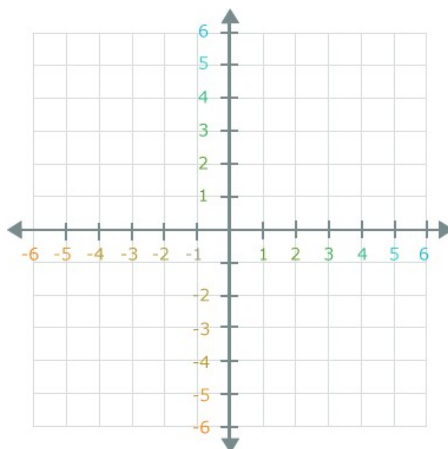
10. Sketch $f(x)$, $g(x)$, and $h(x)$ on the graph provided below.

(Hint: You may use a set of table of values to plot these functions)

$$f(x) = 2^{x-1} - 1$$

$$g(x) = f^{-1}(x)$$

$$h(x) = f^{-1}(x + 2)$$



a. Fill in the following table.

| | $f(x)$ | $g(x)$ | $h(x)$ |
|---------------------|--------|--------|--------|
| Domain | | | |
| Range | | | |
| x -intercept(s) | | | |
| y -intercept(s) | | | |
| Vert. Asymptote(s) | | | |
| Horiz. Asymptote(s) | | | |

b. Graph of $f_1(x) = f(-x) + 2$, $f_2(x) = f(-x + 1) + 1$, and $f_3(x) = f_1(x) + f_2(x)$ are shown below.

Label which graph represents which and **find the smallest value** of $A + d$ if $f_i(x)$ can be represented by $A(b)^{-(x-c)} + d$.

