

NAME: \_\_\_\_\_

**DO NOT** write your answers here, except the graphs. Do it in other sheets and **show all your work**.  
**STAPLE** this sheet to your other sheets.

1. Use the properties of logarithms to expand the following expressions.

a)  $\log_9(5y) =$

b)  $\log_8 x^7 =$

c)  $\log_b(3x^2y^3) =$

d)  $\log_8 \frac{x^{\frac{1}{2}}}{y^3} =$

e)  $\log_5 \sqrt[5]{\frac{x^2}{y}} =$

f) g)  $\ln \left[ \frac{x^4 \sqrt{x^2 + 3}}{(x + 3)^5} \right] =$

---

2. Use the properties of logarithms to condense the following expressions.

a)  $\log x + \log 5 =$

b)  $\log_8 x + 3 \log_8 y =$

c)  $4 \ln(x + 6) - 5 \ln(x + 1) =$

d)  $2 \log x + 3 \log y - 4 \log z =$

e)  $\frac{1}{2}(\log x + \log y) =$

f)  $\frac{1}{3}(\log_7 x + 4 \log_7 y) - 3 \log_7(x + y) =$

---

3. Use the change of base formula to write the following logarithms as logarithms in the indicated base.

a)  $\log_7 12$ ; write it in base 10.

b)  $\log_9 127$ ; write it in base  $e$ .

c)  $\log_{25} 9$ ; write it in base 5 and simplify.

d)  $\log_{\frac{1}{2}} 8$ ; write it in base 2 and simplify.

---

4. If  $\log_2 b = \pi$ , use the change of base formula to find  $\log_b 8 =$ .

---

5. Solve the following equations.

a)  $4^x = 32$ .

b)  $27^x = 81$ .

c)  $2^{2x-1} = 32$

d)  $5^{2-x} = \frac{1}{125}$

e)  $7^{\frac{x-2}{6}} = \sqrt{7}$ .

f)  $8^{1-x} = 4^{x+2}$

---

6. Solve each exponential equation. Express each solution using natural logarithms (i.e. in base  $e$ ) or logarithms in base 10. Then use a calculator to find a decimal approximation, correct to two decimal places.

a)  $5e^x = 7$

b)  $4e^{7x} = 10,273$

c)  $3^{\frac{x}{7}} = 0.2$

d)  $7^{2x-1} = 3^{x+2}$

---

7. Solve the following logarithmic equations.

a)  $\log_5 x = 3$

b)  $\log_4(x - 7) = 3$

c)  $2 \log_5 x = 4$

d)  $\log_5 x - 2 = \log_5 3$

e)  $\log_2 \sqrt{x+4} = 1$

f)  $\log_2(x - 1) + \log_2(x + 1) = 3$

g)  $\log(x + 7) - \log 3 = \log(7x - 1)$

h)  $\log(x + 3) + \log(x - 2) = \log 14$