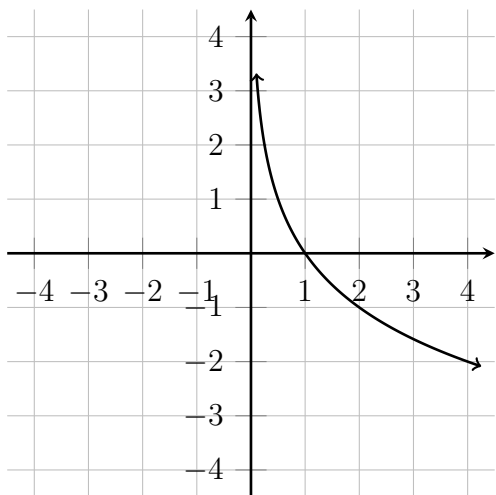
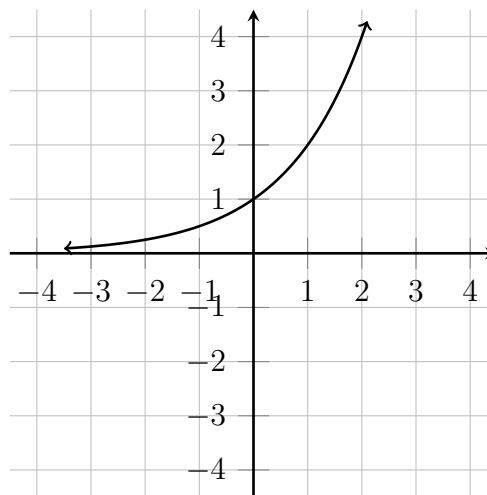


Purpose: In this problem set, you will improve your understanding of logarithmic functions by studying their algebraic properties.

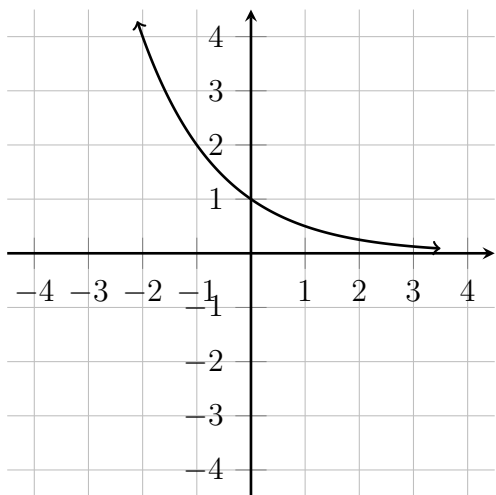
1. Match the functions with their graphs.



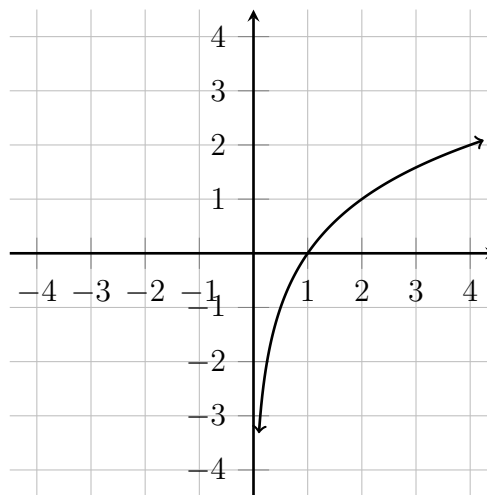
A



B



C



D

_____ $f(x) = \log_{1/2}(x)$

_____ $f(x) = 2^x$

_____ $f(x) = \log_2(x)$

_____ $f(x) = \left(\frac{1}{2}\right)^x$

2. Suppose $f(x) = 5 + \log_3(x - 2)$ and $g(x) = \log_3(x)$.

(a) How can we transform the graph of $g(x)$ into the graph of $f(x)$?

(b) What is the domain and range of $g(x)$? Does the transformation change the domain and range of $f(x)$? If so, list the new domain and range.

3. What is the domain of $g(x) = \log_7(x^2 - 16)$?

4. Using the properties of logs, decide whether these statements are true for any $A, B > 0$, and write T/F next to them. If a statement is true, cite the rule. If a statement is false, give a counterexample (you may use a calculator for this part).

(a) $\log(\sqrt{A}) = \frac{1}{2} \log(A)$

(b) $\ln(A) \ln(B) = \ln(A) + \ln(B)$

(c) $\log(AB) = \log(A) \log(B)$

(d) $p \cdot \ln(A) = \ln(A^p)$

(e) $\frac{\log(A)}{\log(B)} = \log(A) - \log(B)$

(f) $\sqrt{\ln(A)} = \ln(A^{1/2})$

5. WITHOUT A CALCULATOR, find the exact value of each expression below.

(a) $\log\left(\frac{15}{2}\right) + \log\left(\frac{200000}{15}\right)$

(b) $\log_5(10) + \log_5(40) - 4 \log_5(2)$

6. Match each of the expressions on the left with the equivalent expression on the right.

_____ -2

_____ $100^{\log(5/2)}$

_____ $100^{\log(5)/2}$

_____ -1

_____ $\sqrt{2}$

_____ $\frac{1}{2} \log(2)$

_____ $\frac{5}{2} \log(10000)$

_____ $\log(100^{5/2})$

_____ $5 \log(1000)$

_____ $\frac{1}{2}$

(a) $\log\left(\frac{10}{10^2}\right)$

(b) $10^{\log(2)/2}$

(c) 6.25

(d) 5

(e) $\log(\sqrt{2})$

(f) 15

(g) 10

(h) $\log(10^{-2})$

(i) $10^{-\log(2)}$

7. Suppose that $u = \log(3)$ and $v = \log(5)$. Find possible formulas for the following expressions in terms of u and/or v and/or constants (that are not expressed with logs). Your answers should have no logs.

(a) $\log(0.6)$

(c) $\log(90)$

(b) $\log(0.025)$

(d) $\log(\sqrt{1000})$

8. Solve each of the equations below for x .

(a) $5^{2x+1} = 7$

(b) $e^{2x} + 6 = 10$

(c) $10 + 2 \ln(x - 3) = 20$

(d) $\ln(x - 10) + \ln(x - 2) = 0$

(e) $\log_2(x + 4) + \log_2(x - 3) = 3$

(f) $\ln(x - 2) + \ln(2x + 3) = 2 \ln(x)$

(g) $\log_9(x - 3) + \log_9(x + 1) = \log_9(x + 7)$

(h) $\log_2(x) + \log_2(x + 2) - \log_2(4 - x) = 2$

(i) $e^{2x} - e^x - 30 = 0$

(j) $3e^{2x} - 2e^x - 16 = 0$