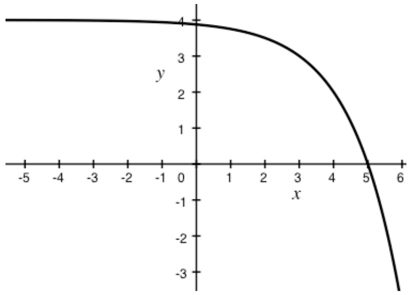
**Practice exercises - Exam 4 (Sections 6.3 through 6.8, Section 8.1)**

1. Sketch the graph of $g(x) = -2^{x-3} + 4$. What is the domain of this function? Are there any asymptotes?
2. Find the value of $\log_4(2)$ and $\log_4\left(\frac{1}{16}\right)$.
3. Find the domain of the logarithmic function $f(x) = \ln(x^2 - 2x - 8)$.
4. Rewrite the expression $2\log_3(x^3) + \log_3(y) - \frac{1}{2}\log_3(y)$ as a single logarithm.
5. Rewrite the expression $\log\left(\frac{3x^2}{\sqrt[3]{y}}\right)$ as a sum and/or difference of simpler logarithms.
6. Use the change of base formula to evaluate $\log_6(30)$.
7. Find all solutions to the logarithmic equation $\log_6(x+3) + \log_6(x+4) = 1$.
8. Find all solutions to the exponential equation $4 \cdot 3^{2x+5} = 16$. Find the exact solution and then use your calculator to get a decimal approximation.
9. Suppose you invest $3500 in an account the pays 5% interest. Find the amount of money you will have in the account after 2 years if the interest is compounded monthly. What if the interest is compounded continuously?
10. Assume that a bacteria culture grows exponentially. If 500 bacteria are present initially, and 800 are present after 1 hour, how many will be present in the culture after 5 hours?
11. Assuming a radioactive substance decays according to the model $A(t) = A_0 e^{-.02t}$ where $t$ is measured in years, find the half-life of this radioactive substance.
12. Use the method of substitution to find all solutions to the system $\begin{cases} x - y &= 2 \\ 2x + 3y &= 9 \end{cases}$
13. Use the elimination method to solve $\begin{cases} 3x - 2y &= 0 \\ 5x + 10y &= 4 \end{cases}$

**Answers**

1. Reflect the graph of $2^x$ across the *x*-axis and then shift 3 units right and 4 units up. The domain is all real *x*, and the line $y$ =4 is a horizontal asymptote.




2. $\log_4(2)$=$\frac{1}{2}$ and $\log_4\left(\frac{1}{16}\right) = -2.$

3. Solving $x^2 - 2x - 8 > 0$ using a sign chart gives the intervals $(-\infty, -2)$ and $(4, \infty)$ for the domain.

4. $\log_3\left(x^6\sqrt{y}\right)$.

5. $\log(3) + 2\log(x) - \frac{1}{3}\log(y)$.

6. $\log_6(30) = \frac{\log(30)}{\log(6)} \approx 1.8982.$

7. Exponentiating both sides leads to the equation $(x+3)(x+4) = 6$ which has solutions $x = -6$ and $x = -1$. Only $x = -1$ solves the original equation ($x = -6$ is extraneous).

8. Dividing by 4 and then taking $\log_3$ of both sides yields $x = \frac{\log_3(4)-5}{2} \approx -1.869.$

9. Monthly gives $3500\left(1 + \frac{.05}{12}\right)^{24} = 3867.29$ while continuous compounding gives $3500e^{.05\cdot 2} = 3868.10$.

10. Find the growth constant $k = .47$ by solving $800 = 500e^{k\cdot 1}$, and then substitute $t = 5$ into $500e^{.47t}$ to find the population of approximately $5243$ bacteria.

11. $t = \frac{\ln\left(\frac{1}{2}\right)}{-.02} \approx 34.657$ years.

12. $x = 3$ and $y = 1$ (*solving for* $x$ *in the top equation is fairly efficient*)

13. $x = \frac{1}{5}$ and $y = \frac{3}{10}$ (*multiplying the top equation by* $5$ *is fairly efficient*)