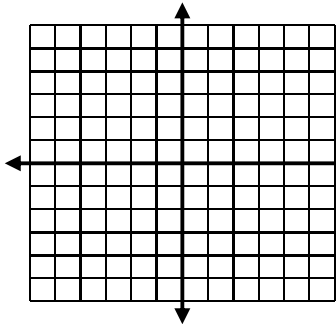Name:_____

Hour:_____

Graph the function. Identify the domain and range in interval notation and the horizontal or vertical asymptote.

1. $y = e^x$
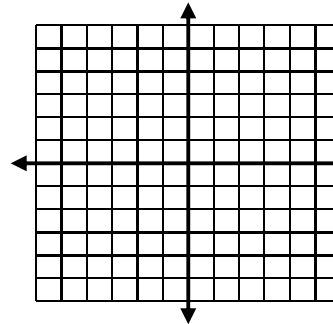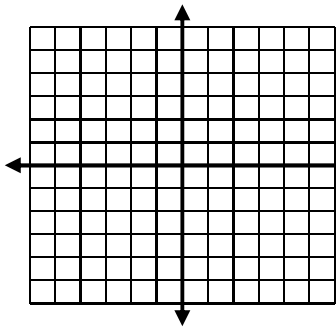
D:_____

R:_____

HA:_____

2. $y = e^{x-1} + 3$
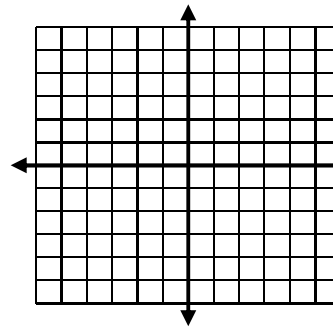
D:_____

R:_____

HA:_____

3. $y = \log_3 x$

D:_____

R:_____

VA:_____

4. $y = 2 - \log_3(x + 1)$
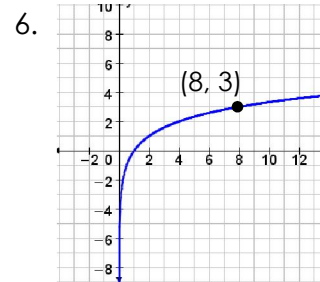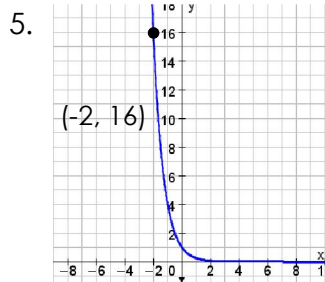
D:_____

R:_____

VA:_____

In #5, find a function of the form $y = a^x$ for the given graph. In #6, find a function of the form $y = \log_a x$ for the given graph.

5.

(-2, 16)

6.

(8, 3)

7. Suppose $1000 is invested in an account that earns 10% annual interest. Find the amount of money earned after 5 years if it is compounded

   a) Semiannually

   b) Continuously

Express the function in its opposite form.

8. $3^4 = 81$ 9. $e^x = 2$ 10. $\log_4 16 = 2$ 11. $\ln x = 5$

Evaluate the expression.

12. $\log_7 343$ 13. $\log_6 \sqrt{6}$ 14. $\log_5 25^8$

15. $e^{\ln 6}$ 16. $\log_3 189 - \log_3 7$ 17. $\log_4 2 + \log_4 128$

Find the _domain_ of the function.

18. $y = \log_2(x + 3)$ 19. $y = \ln(2 - 5x)$

Use the Laws of Logarithms to _condense_ the expression.

20. $\ln 6 + 5\ln x + 9\ln(x^2 + 9)$ 21. $2\log x - 4\log y + \frac{1}{2}\log z$

Use the Laws of Logarithms to _expand_ the expression.

22. $\log\left(\frac{x^2}{yz^2}\right)$ 23. $\log\sqrt{\frac{x-1}{x^2}}$

Solve the equation. Round answers to the nearest thousandth.

24. $3^x = 26$ 25. $e^{2-3x} = 12$ 26. $12^x = 5^{x+4}$

27. $x^3 9^x - 9^x = 0$ 28. $e^{2x} - 5e^x + 4 = 0$

Solve the equation. Round answers to the nearest thousandth.

29. $\ln x = 5$

30. $\log(9x + 6) = 2$

31. $\log_3(4 - x) = 7$

32. $\log_3(x + 4) - \log_3(x - 4) = 3$

33. $\log(x + 2) + \log(x - 1) = 1$

34. Find the time required for an investment of $3000 to increase to $8000 if it is compounded quarterly at 8% annual interest.

35. The number of bacteria in a culture is given by $n(t) = 400e^{0.49t}$, where t is measured in hours.

   a) How many bacteria remain after 5 hours?

   b) After how many hours will the number of bacteria reach 10,000?

36. The fox population in a certain region has a growth rate of 6% per year. It is estimated that the population in 2000 was 16,000 foxes.

   a) Find a function that models the population t years after 2000.

   b) Estimate the fox population in 2012.

37. Uranium-234 has a half-life of 2.7×10^5 years.

   a) Find the mass remaining of a 10 mg sample after 1000 years.

   b) How long will it take for the substance to decompose to 7 mg?

38. The half-life of palladium-100 is 4 days. After 20 days a sample has decomposed to a mass of 0.375 g.

a) Find a function modeling the mass remaining after t days.

b) After how many days will only 0.15 g remain?

39. Newton's Law of Cooling is used in homicide investigations to determine time of death. Normal body temperature is 98.6°F. The body begins to cool immediately after death. It has been determined experimentally that k = 0.1947. Suppose a body was found outside where the temperature was 50°F.

a) Find a function that models the temperature t hours after death.

b) If the body had a temperature of 76°F, then how long ago was the time of death?

40. A kettle full of water is brought to a boil in a room with a temperature of 20°C. After 15 minutes, the temperature of the water has increased from 70°C to 100°C. Find the temperature of the water after **another** 10 minutes.
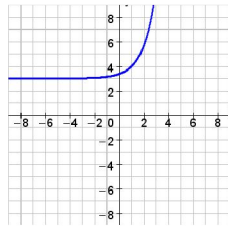
Pre-Calculus
Chapter 4 Review Answers
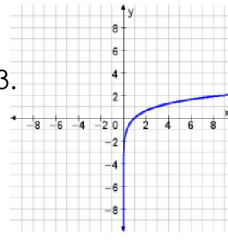
1.
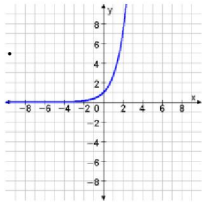
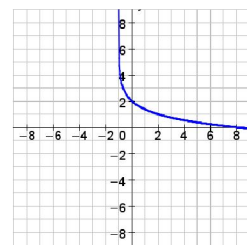2.

3.

4.

D: $(-\infty, \infty)$ R: $(0, \infty)$ HA: y =0   D: $(-\infty, \infty)$ R: $(3, \infty)$ HA: y =3   D: $(0, \infty)$ R: $(-\infty, \infty)$ VA: x =0   D: $(-1, \infty)$ R: $(-\infty, \infty)$ VA: y =-1

5. $y = \left(\frac{1}{4}\right)^x$ 6. $y = log_2 x$ 7a. \$1,628.89   7b. \$1648.72   8. $log_3 81 = 4$ 9. ln 2 = x   10. $4^2 = 16$ 11. $e^5 = x$ 12. 3

13. ½   14. 16   15. 6   16. 3   17. 4   18. $(-3, \infty)$ 19. $\left(-\infty, \frac{2}{5}\right)$ 20. $ln6x^5(x^2 + 9)^9$ 21. $log\left(\frac{x^2\sqrt{z}}{y^4}\right)$

22. $2logx - (logy - 2logz)$ 23. $\frac{1}{2}[log(x - 1) - logx^2]$ or $\frac{1}{2}log(x - 1) - logx$ 24. 2.967   25. -0.162   26. 7.353   27. 1   28. 0, 1.386

29. 148.413   30. 10.444   31. -2183   32. 4.308   33. 3   34. 12 yrs   35a. 4635.34   35b. 6.57 hrs   36a. $n(t) = 16000e^{.06t}$

36b. ≈32871 foxes   37a. 9.97 mg   37b. 138.934.76 yrs   38a. $m(t) = 12e^{-.173t}$ 38b. ≈25 days   39a. $T(t) = 50 + 48.6e^{-.1947t}$

39b. 3.2 hrs ago   40. 129.43°C