

Honors PreCalc – Chapter 3 Homework Packet

- 1) Suppose that the average cost to build a new home doubles every 22 years. If the average cost to build a new home is currently \$375,000, what will be the cost if you are ready to build your first home in 15 years?

- 2) Identify the equation of the asymptote for each graph.
 - a) $f(x) = e^x$
 - b) $f(x) = e^x - 5$
 - c) $f(x) = e^x + 8$
 - d) $f(x) = e^{x-2}$
 - e) $f(x) = -\frac{1}{2}e^{-x}$

- 3) You invest \$14,000 in an account that compounds 6% per year. If you leave the money in the account for 25 years, how much more money will you have if the 6% is compounded quarterly than if the 6% is compounded annually?

- 4) Sketch the graph of $f(x) = 2^{x-3} - 5$. Label at least three points. Try to sketch the graph without using a graphing calculator. Instead, focus on the transformations of the parent function.

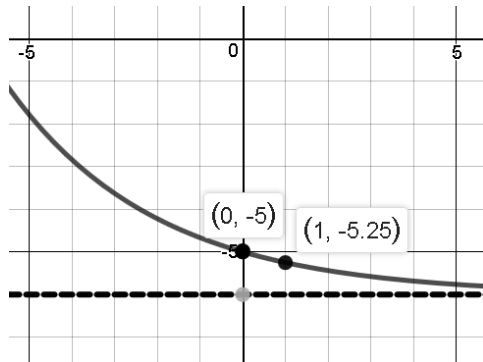
- 5) Fill in the blanks for the function $f(x) = e^x$.
 - a) As x approaches infinity, $f(x)$ approaches _____.
 - b) As x approaches negative infinity, $f(x)$ approaches _____.

- 6) A Honda Civic depreciates in value at a rate of about 11% per year. If you bought a Civic for \$19,700, how much will it be worth after 5 years?

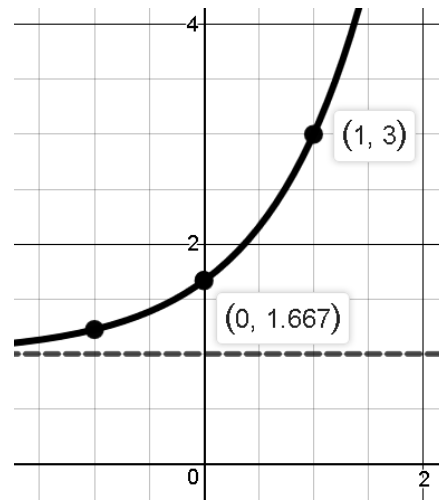
7) The value of your home increases 5% per year for a ten-year period. What is the overall percent increase of the value over the ten-year period?

8) Write the equation of each exponential graph below.

a)



b)



9) Which of the following functions are equivalent?

a) $y = \frac{1}{5} \left(\frac{3}{4} \right)^x$

b) $y = 5^{-1} \left(\frac{4}{3} \right)^{-x}$

c) $f(x) = \frac{3}{20} \left(\frac{3}{4} \right)^{x-1}$

d) $g(x) = \left(\frac{4}{15} \right) \left(\frac{3}{4} \right)^{x+1}$

10) Fill out the table below for the function $y = 2^x - 2$.

asymptote	
x-intercept	
y-intercept	
domain	
range	

11) The population P (in millions) of Italy can be modeled using the formula $P = 57.563e^{0.0052t}$ where t represents the year with $t = 0$ corresponding to the year 2000.

a) According to the model, is the population of Italy increasing or decreasing? How do you know?

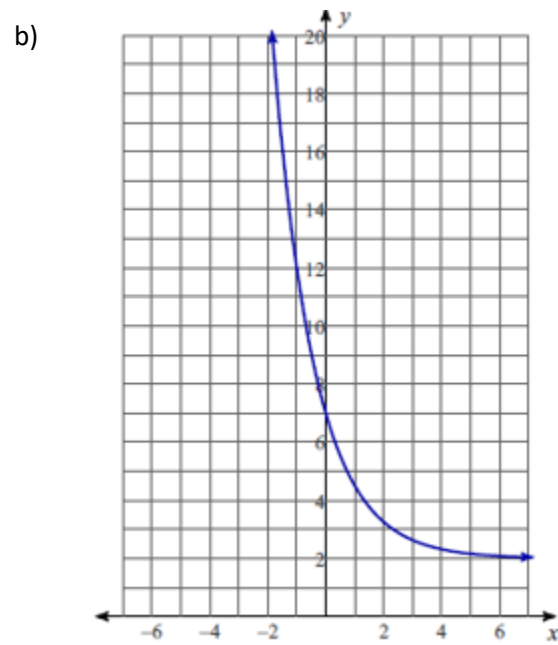
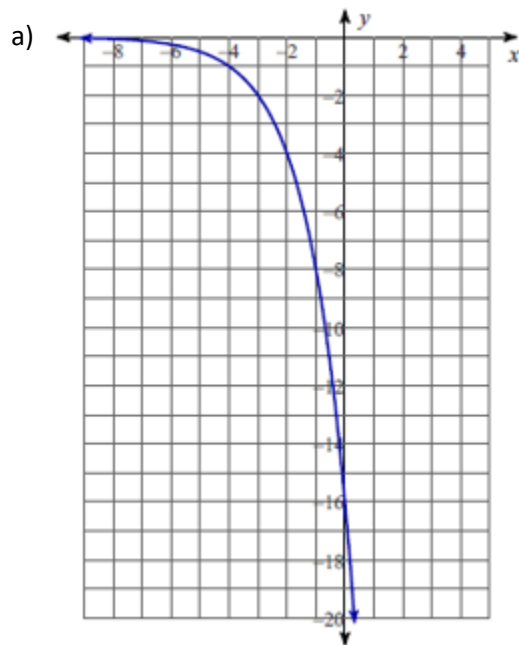
b) Use the model to predict the population in the year 2020.

12) Danielle invests \$7,103 in a savings account with a fixed interest rate of 2% compounded continuously. What will the account balance be after 6 years?

13) Pranav invests \$2,295 in a savings account with a fixed annual interest rate compounded 12 times per year. After 12 years, the balance is \$3,288.01. What is the interest rate of the account?

14) Brenda invests a sum of money in a retirement account with a fixed annual rate of 3% compounded continuously. After 13 years, the balance reaches \$3,540.32. What was the amount if the initial investment?

15) For each graph, determine the domain, range, intercepts, asymptotes, and end behavior. Write the equation of the function.



16) Simplify using only positive exponents.

a) $-3x^{-3}$

b) $-5\left(\frac{3}{2}\right)(4-9x)^{\frac{-1}{2}}(-9)$

c) $2\left(\frac{2}{2-x}\right)\left[\frac{-2}{(2-x)^2}\right]$

d) $(16x^2y)^{\frac{3}{4}}$

e) $-\frac{x^{\frac{-1}{2}}}{2}\sin\sqrt{x}$

f) $\frac{\sqrt{4x-16}}{\sqrt[4]{(x-4)^3}}$

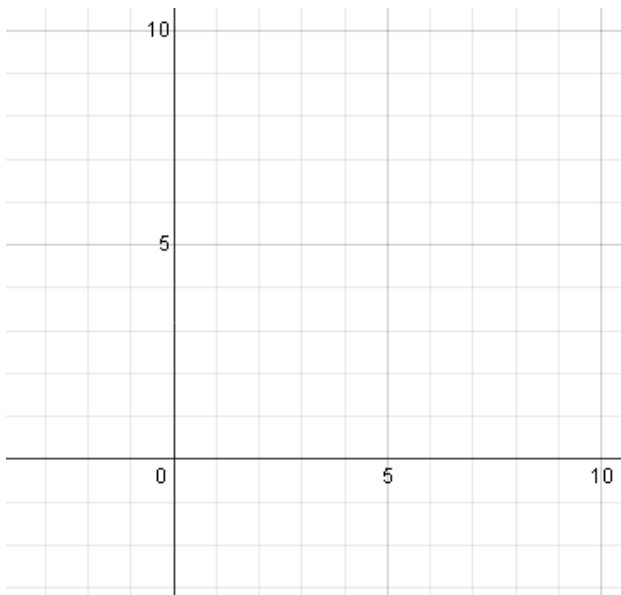
g) $-4\left(\frac{2x-1}{2x+1}\right)^{-3}\left[\frac{2(2x+1)-2(2x-1)}{(2x+1)^2}\right]$

h) $\frac{\frac{1}{2}(2x+5)^{-\frac{3}{2}}}{\frac{3}{2}}$

i) $\left(\frac{1}{x^{-2}} + \frac{4}{x^{-1}y^{-1}} + \frac{1}{y^{-2}}\right)^{\frac{-1}{2}}$

j) $3x(3x+1)^{-1} - 4$

17) Graph $f(x) = 2^x$ and $g(x) = \log_2 x$ on the same coordinate plane. What do you notice about the two graphs?



18) Determine the value of each without using a calculator.

a) $\log 1000$ b) $\log_3 81$ c) $\log_5 \frac{1}{125}$ d) $\ln e$

e) $\ln e^8$ f) $\log 10^n$ g) $\log_{\frac{1}{10}} 100$ h) $\ln 1$

19) Without using a calculator, determine what two whole numbers the following values must be between.

a) $\log_9 100$ b) $\log_2 15$ c) $\log_{15} 300$

20) Evaluate. You may use a calculator.

a) $\ln 84$ b) $\log_8 15$ c) $\ln 999$ d) $\log_{12} 250$

21) Determine the inverse of each function.

a) $y = \frac{1}{2} \square 4^x$ b) $f(x) = 3e^x - 1$

22) What asymptote(s) does each graph have?

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

b) $y = \log_6 x - 4$

c) $g(x) = -3\log_4 x$

23) Sketch the graph of each. Graph the asymptotes.

a) $y = \log(-x)$

b) $f(x) = 2\log_2(x-1)$

24) Carbon-14 has a half-life of 5,730 years. A fossil is found that has 13% of its original carbon-14. Approximately how old is the fossil?

25) Expand each expression.

a) $\log_4(xz)$

b) $\ln \sqrt[3]{\frac{y^4}{z^5}}$

c) $\log \sqrt{z\sqrt{y\sqrt{x}}}$

d) $\ln \frac{\sqrt[3]{z}}{x\sqrt{y}}$

26) Write the expression as one logarithm.

a) $\log_3 x + \log_3(5y)$

b) $\ln x - \ln(7y)$

c) $2\log_a x + \frac{1}{3}\log_a(x-2) - 5\log_a(2x+3)$

d) $\frac{1}{3}[2\ln(x+3) + \ln x - \ln(x^2-1)]$

e) $\ln y^3 + \frac{1}{3}\ln(x^3y^6) - 5\ln y$

f) $2\ln x - 4\ln\left(\frac{1}{y}\right) - 3\ln(xy)$

27) Evaluate. Round to the nearest hundredth.

a) $\frac{\ln 7}{\log_5 9}$

b) $\log_5 81$

28) Use your graphing calculator to solve the following equation: $\ln(x+3) = (\log_4 x)^2$

29) Determine the exact value of the logarithm without using a calculator (if possible).

a) $\log_6 \sqrt[3]{6}$

b) $\log_4(-16)$

c) $\log_5 \frac{1}{125}$

d) $\ln e^3 - \ln e^7$

e) $\ln 1$

f) $\log_{10} 0$

g) $\ln \sqrt[5]{e^3}$

h) $\log_4 2 + \log_4 32$

30) Simplify completely without using a calculator. Leave in exact form.

a) $10^{\log\left(\frac{1}{100}\right)}$

b) $e^{\ln 7}$

c) $\log_5 7 + \frac{3}{\ln 5}$

31) Sketch the graph of the following. Identify the domain and range of each.

a) $f(x) = 1 + 2\log x$

b) $f(x) = \ln(2x + 4)$

c) $y = \log_2(x - 1)$

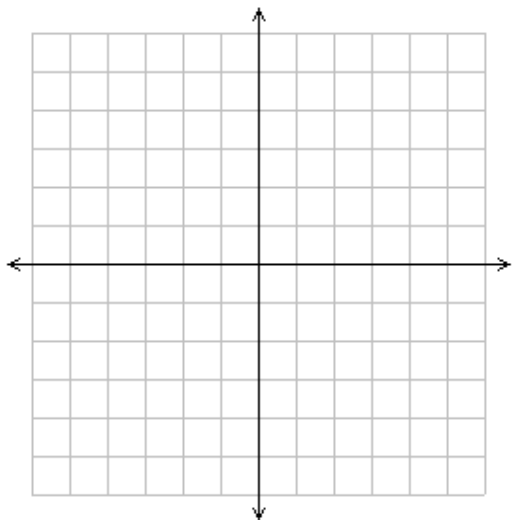
d) $g(x) = -\log(-x)$

32) Determine the x - and y -intercepts of each of the following. Leave as an exact answer.

a) $y = 2\ln(3x)$

b) $h(x) = -\log_5(x + 7)$

33) Write the following function as a piecewise function and then graph: $f(x) = \log_3|x-2|$

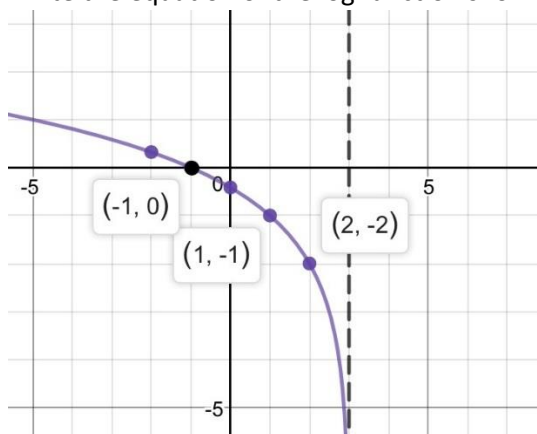


34) A log function is in the form $y = \log_b(x-a)$ and passes through the points (7,0) and (19,1). Determine the equation of the function.

35) A log function is in the form $y = \log_b(x-a)$ and passes through the points (-6,0) and (42,2). Determine the equation of the function.

36) A log function has an asymptote at $x = 1$ and passes through the points (2,0) and (3, -1). Write the equation of the function.

37) Write the equation of the log function shown below.



38) Write a logarithmic function that approaches negative infinity as x approaches infinity.

39) Students in math class took an exam and then took a retest monthly with an equivalent exam. The average scores for the class are given by the human memory model $f(t) = 80 - 17 \log(t + 1)$ for $t \in [0, 12]$ where t is the time in months.

a) What was the average score on the original exam?

b) What was the average score after 10 months?

40) Solve.

a) $e^{x^2-3} = e^{x-2}$

b) $2^{x+1} = e^{1-x}$

c) $3^{x^2} = 7^{6-x}$

d) $e^{2x} - 5e^x + 6 = 0$

e) $\frac{400}{1 + e^{-x}} = 350$

41) Solve.

a) $\ln \sqrt{x-8} = 5$

b) $\ln x - \ln(x+1) = 2$

c) $\ln(x+1) - \ln(x-2) = \ln x$

d) $\log 8x - \log(1 + \sqrt{x}) = 2$

42) Solve.

a) $2x^2 e^{2x} + 2x e^{2x} = 0$

b) $2x \ln\left(\frac{1}{x}\right) - x = 0$