Homework: Section 8.3 HW

Score: 0 of 1 pt

7 of 9 (0 complete)

8.3.31

Find the indicated sum. Use the formula for the sum of the first n terms of a geometric sequence.

$$\sum_{i=1}^{4} 2^i (i-2)$$

$\sum_{i=1}^{4} 2^i = \square$

$$\sum_{i=1}^{4} 2^i (i-2)$$

end

start

Add

start by plugging in 1 for i

Continue adding and plugging in for i until we've plugged in 4

$$2^1(1-2) + 2^2(2-2) + 2^3(3-2) + 2^4(4-2) \rightarrow 2^1(-1) + 2^2(0) + 2^3(1) + 2^4(2)$$

$$2(-1) + 4(0) + 8(1) + 16(2)$$

$$-2 + 0 + 8 + 32$$

$$38$$

$$\sum_{i=1}^{4} 2^i (i-2)$$

$$\sum_{j=1}^{4} 2^j (j-2)$$

Homework: Section 8.3 HW

Score: 0 of 1 pt

8 of 9 (0 complete)

8.3.27

Find the sum of the first 11 terms of the geometric sequence. Use the formula for the sum of the first n terms of a geometric sequence.

a_1

6, −30, 150, −750, ...

The sum of the first 11 terms of the geometric sequence is $\square$.

(Simplify your answer.)

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

Sum

number of terms

$a_1 = 1^{st}$ term $= 6$

$n = 11$

$r =$ common ratio $= -5$

S_{11} = sum of the first 11 terms

$$\underbrace{6, \; -30}_{\times(-5)}, \; \underbrace{150}_{\times(-5)}, \; \underbrace{-750}_{\times(-5)}, \ldots$$

$$S_{11} = \frac{6(1-(-5)^{11})}{1-(-5)} = \left(6(1-(-5)^{11})\right) \div \left(1-(-5)\right) = 8{,}138{,}021$$

Quiz #7, #6

Express the sum using summation notation. Use 1 as the lower limit of summation and i for the index of summation.

$$8 + \frac{8^2}{2} + \frac{8^3}{3} + \cdots + \frac{8^n}{n} = \frac{8^1}{1} + \frac{8^2}{2} + \frac{8^3}{3} + \cdots + \frac{8^n}{n}$$

$$\frac{8^4}{4} + \frac{8^5}{5}$$

The summation starts at i = 1. What is the upper limit of summation and the general term?

stop

$$\sum_{i=1}^{\boxed{n}} \boxed{\frac{8^i}{i}}$$

stop

$$\frac{8^1}{1} + \frac{8^2}{2} + \frac{8^3}{3} + \frac{8^4}{4} = \sum_{i=1}^{4} \frac{8^i}{i}$$

start

doesn't stop

$$\frac{8^1}{1} + \frac{8^2}{2} + \frac{8^3}{3} + \cdots = \sum_{i=1}^{\infty} \frac{8^i}{i}$$

Quiz: Quiz #7 (Due 7/19 at 11:59pm)

This Question: 1 pt

Find the sum of the first 50 terms of the arithmetic sequence below.

− 13, − 6, 1, 8, ...

The sum is ☐.

$-13, -6, 1, 8, \ldots$

$+7 \quad +7 \quad +7$

1^{st} term $= -13$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

n^{th} term $= 50^{th}$ term

number of terms $= 50$

$$a_n = a_1 + (n-1)d$$

difference $= 7$

\# of terms $= 50$

1^{st} term $= -13$

$$a_{50} = -13 + (50-1)\cdot 7$$
$$= -13 + 49\cdot 7$$
$$= -13 + 343$$
$$= 330$$

$$S_{50} = \frac{50}{2}(-13+330)$$
$$= \frac{50}{2}(317) = 25(317) = 7925$$

recursive: $a_6 = 6^{th}$ term

need 5^{th} term

a_5

need 4^{th} term

a_4

need 3^{rd} term

a_3

need 2^{nd} term

a_2

need 1^{st} term

a_1

Homework: Section 5.5 HW

Score: 0 of 1 pt

7 of 7 (0 complete)

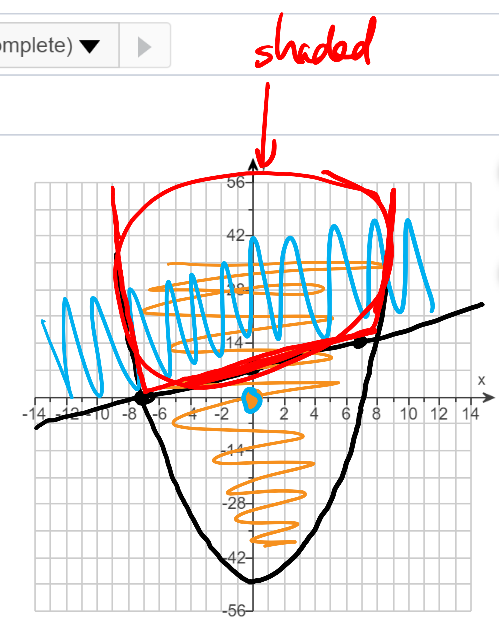
5.5.45

Graph the solution set of the following system of inequalities.

$$y \geq x^2 - 49$$
$$x - y \geq -7$$

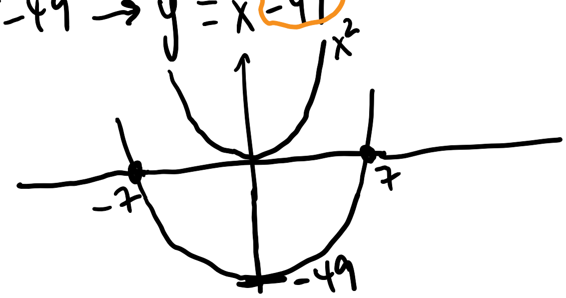
Use the graphing tool to graph the system.

Click to enlarge graph



vertical shift down

$y \geq x^2 - 49 \rightarrow y = x^2 - 49$



x-intercepts: Set $y=0$

$$0 = x^2 - 49$$
$$+49 \qquad +49$$
$$\pm\sqrt{49} = \sqrt{x^{\cancel{2}}}$$
$$\pm 7 = x$$

Pick: (0,0) and plug in

$$y \geq x^2 - 49$$
$$0 \geq 0^2 - 49$$
$$0 \geq -49 \checkmark$$

$$x - y \geq -7$$

$x - y = -7$ line

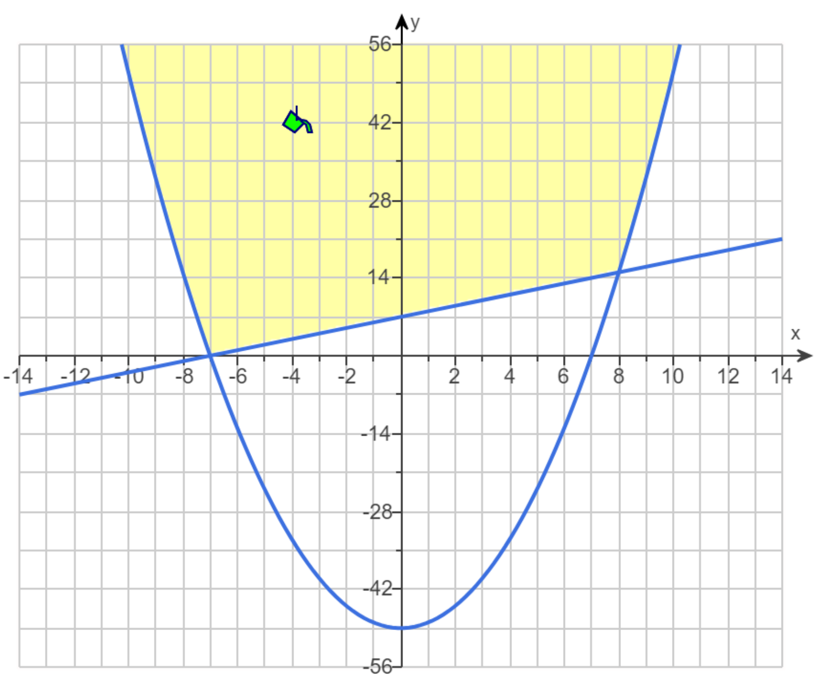
$$\cancel{x} - y = -7$$
$$-\cancel{x} \qquad -x$$
$$\frac{-y}{-1} = \frac{-x-7}{-1}$$

$y = x + 7$ y-int

slope $= 1 = \frac{1}{1} = \frac{7}{7}$

Pick: (0,0)

$$0 - 0 \geq -7$$
$$0 \geq -7 \; X$$



Quiz: Quiz #6 (Due 7/12 at 11:59pm)

This Question: 1 pt

Use properties of logarithms to expand the logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

$$\log_b\left(\frac{x^2y}{z^8}\right)$$

$$\log_b\left(\frac{x^2y}{z^8}\right) = \square$$

$\log_b(x^2y) - \log_b(z^8)$ Quotient rule

$\log_b(x^2) + \log_b(y) - \log_b(z^8)$ Product rule

$2\log_b(x) + \log_b(y) - 8\log_b(z)$

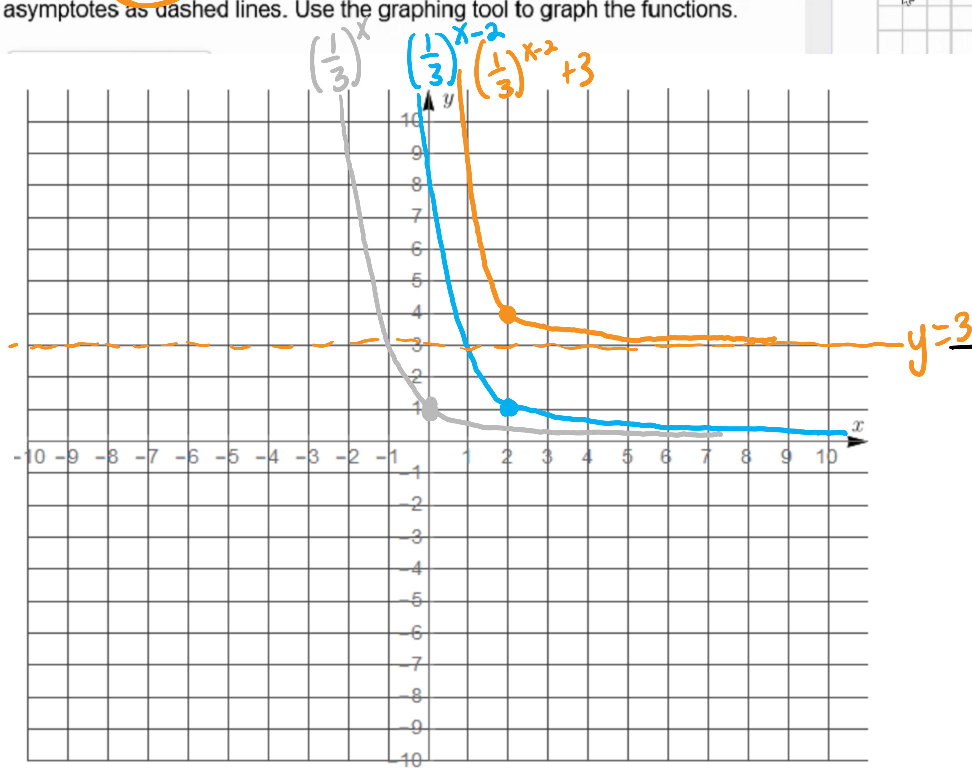
Test: Exam #3 Review (Optional)

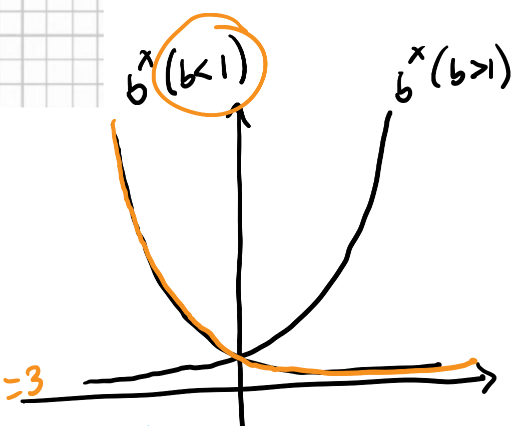
This Question: 1 pt

Graph functions f and g in the same rectangular coordinate system. Graph and give the equations of all asymptotes.

$f(x) = \left(\frac{1}{3}\right)^x$ and $g(x) = \left(\frac{1}{3}\right)^{x-2} + 3$

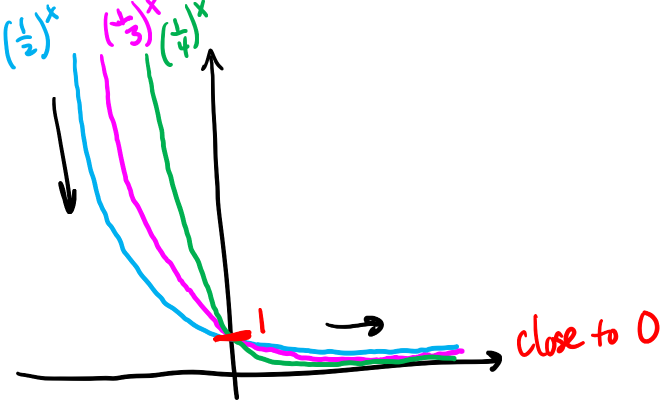
Graph $f(x) = \left(\frac{1}{3}\right)^x$ +3 and $g(x) = \left(\frac{1}{3}\right)^{x-2} + 3$ and their asymptotes. Graph the asymptotes as dashed lines. Use the graphing tool to graph the functions.





1st horizontal shift right by 2

$\left(\frac{1}{3}\right)^{x-2}$ $+3$ 2nd vertical up by 3



Quiz: Quiz #6 (Due 7/12 at 11:59pm) Show completed problem Submit Qui

This Question: 1 pt 11 of 16 (0 complete) **This Quiz:** 16 pts possib

A bird species in danger of extinction has a population that is decreasing exponentially $(A = A_0 e^{kt})$. Seven years ago the population was at 1600 and today only 1000 of the birds are alive. Once the population drops below 300, the situation will be irreversible. When will this happen?

The population will drop below 300 birds approximately ☐ years from now.
(Do not round until the final answer. Then round to the nearest whole number as needed.)

$$\frac{\cancel{1600} e^{7k}}{\cancel{1600}} = \frac{1000}{1600}$$

$$e^{7k} = 0.625$$

$$\cancel{\ln e}^{7k} = \ln 0.625$$

$$k = \frac{\ln 0.625}{7} = -0.067$$

$$A = A_0 e^{kt} ?$$

when it's 300

$$\frac{300}{1000} = \frac{\cancel{1000} e^{-0.067t}}{\cancel{1000}}$$

$$.3 = e^{-0.067t}$$

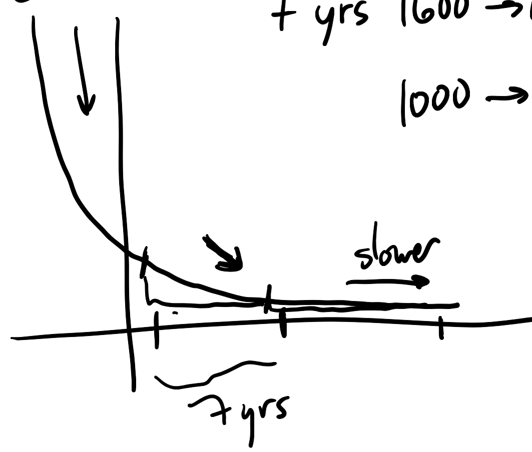
$$\ln .3 = \cancel{\ln e}^{-0.067t}$$

$$t = \frac{\ln .3}{-0.067} = 18$$

$e^{-0.067}$

7 yrs 1600 → 1000 (drop of 600)

1000 → 300 (drop of 700)



Test: Exam #3 Review (Optional)

Show completed problem Subm

This Question: 1 pt

This Test: 32 pts p

The half-life of the radioactive element unobtanium-43 is 10 seconds. If 48 grams of unobtanium-43 are initially present, how many grams are present after 10 seconds? 20 seconds? 30 seconds? 40 seconds? 50 seconds?

The amount left after 10 seconds is 24 grams.

The amount left after 20 seconds is ☐ grams.

The amount left after 30 seconds is ☐ grams.

The amount left after 40 seconds is ☐ grams.

The amount left after 50 seconds is ☐ grams.

(Round to one decimal place.)

half-life = time it takes to have $\frac{1}{2}$ the amount

$A = A_0 e^{kt}$

amount after time t

initial amount

rate of change

$$\frac{24}{48} = \frac{\cancel{48} e^{k(10)}}{\cancel{48}}$$

$$0.5 = e^{10k}$$

$$\ln 0.5 = \cancel{\ln} \cancel{e}^{10k}$$

$$\frac{\ln 0.5}{10} = \frac{\cancel{10}k}{\cancel{10}}$$

$$k = \frac{\ln 0.5}{10} = -0.069$$

$$A = 48e^{-0.069t}$$

After 20s: $A = 48e^{-0.069(20)} = 12.1$

Test: Exam #3 Review (Optional)

Show completed problem | Submit Test

This Question: 1 pt | 16 of 32 (0 complete) | **This Test:** 32 pts possible

Solve the following logarithmic equation. Be sure to reject any value of x that is not in the domain of the original logarithmic expression. Give the exact answer. Then use a calculator to obtain a decimal approximation, correct to two decimal places, for the solution.

$4 + 8\ln x = 2$

Solve the equation. What is the exact solution? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }.
  (Type an exact answer. Type your answer using exponential notation.)
- B. There are infinitely many solutions.
- C. There is no solution.

What is the decimal approximation to the solution? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }.
  (Type an integer or decimal rounded to two decimal places as needed.)
- B. There are infinitely many solutions.
- C. There is no solution.

$$\cancel{4} + 8\ln x = 2$$
$$-\cancel{4} \qquad\qquad -4$$

Goal: $x =$ something

$$\frac{\cancel{8}\ln x}{\cancel{8}} = \frac{-2}{8}$$

$$\ln x = -\frac{1}{4}$$
$$\downarrow$$
$$\log_e x = -\frac{1}{4}$$

$$\cancel{e}^{\cancel{\log_e} x} = e^{-\frac{1}{4}}$$

$$x = e^{-\frac{1}{4}} \leftarrow \text{exact answer}$$

e ^ (−1 ÷ 4)

$$x = 0.78$$

Test: Exam #3 Review (Optional)

This Question: 1 pt | 13 of 32 (0 complete)

Solve the exponential equation by expressing each side as a power of the same base and then equating exponents.

$$2^{\frac{x-8}{10}} = \sqrt{2}$$

The solution set is { }.

$$2^{\frac{x-8}{10}} = \sqrt{2}$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$$

$$2^{\frac{x-8}{10}} = 2^{\boxed{}}$$

$$\sqrt{2} = \sqrt[2]{2^1} = 2^{\frac{1}{2}}$$

$$\cancel{2}^{\frac{x-8}{10}} = \cancel{2}^{\frac{1}{2}}$$

same base

$$4^{\frac{x-8}{10}} = \cancel{\sqrt{8}}\ 8^{\frac{1}{2}}$$

$$(2^2)^{\frac{x-8}{10}} = (2^3)^{\frac{1}{2}}$$

$$\frac{x-8}{10} \times \frac{1}{2}$$

$$\cancel{2}^{2\left(\frac{x-8}{10}\right)} = \cancel{2}^{3\left(\frac{1}{2}\right)}$$

$$\cancel{1000}^{\frac{x-8}{10}} = \cancel{1000}^{\frac{1}{2}}$$

$$2(x-8) = 10(1)$$

$$2x - 16 = 10$$

$$+16 \quad +16$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{26}{2}$$

$$x = 13$$

Test: Exam #3 Review (Optional)

This Question: 1 pt

Find the domain of the following logarithmic function.

$g(x) = \textbf{ln}\,(x-15)^2$

The domain is $\boxed{}$.

(Type your answer in interval notation.)

$\sqrt{}$

inside can't be negative

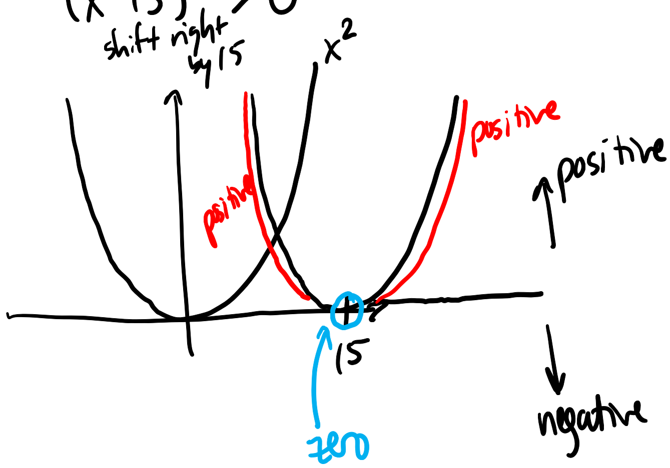
only allowed: positives or zero

$\log(\quad)$

inside can't be negative or zero

only allowed: positives

$(x-15)^2 > 0$



Domain: $(-\infty, 15) \cup (15, \infty)$

Test: Exam #3 Review (Optional)

Show co

This Question: 1 pt

14 of 32 (0 complete)

Solve the following exponential equation. Express the solution set in terms of natural logarithms or common logarithms. Then, use a calculator to obtain a decimal approximation for the solution.

$5e^{7x} = 1315$

The solution set expressed in terms of logarithms is { }.
(Use a comma to separate answers as needed. Simplify your answer. Use integers or fractions for any numbers in the equation. Use **ln** for natural logarithm and **log** for common logarithm.)

Now use a calculator to obtain a decimal approximation for the solution.

The solution set is { }.
(Use a comma to separate answers as needed. Round to two decimal places as needed.)

$$\frac{\cancel{5}e^{7x}}{\cancel{5}} = \frac{1315}{5}$$

Goal: x = something

$$e^{7x} = 263$$

$$\cancel{\ln e}^{7x} = \ln 263$$

$$\frac{\cancel{7}x}{\cancel{7}} = \frac{\ln 263}{7}$$

$$x = \frac{\ln 263}{7} = 0.80$$

$$\ln(263) \div 7$$

Quiz: Quiz #6 (Due 7/12 at 11:59pm)

Show completed problem | Submit Quiz

This Question: 1 pt | 6 of 16 (0 complete) | **This Quiz:** 16 pts possible

Solve the exponential equation. Express the solution in terms of natural logarithms or common logarithms. Then use a calculator to obtain a decimal approximation for the solution.

$10^x = 2.62$

The solution set expressed in terms of logarithms is $\{\square\}$.
(Use a comma to separate answers as needed. Simplify your answer. Use integers or decimals for any numbers in the expression. Use **ln** for natural logarithm and **log** for common logarithm.)

Now use a calculator to obtain a decimal approximation for the solution.

The solution set is $\{\square\}$.
(Use a comma to separate answers as needed. Round to two decimal places as needed.)

$10^x = 2.62$

$\cancel{\log_{10}} \cancel{10}^x = \log_{10} 2.62$

$x = \log_{10} 2.62$

$x = \log 2.62$

$x = 0.42$

$\boxed{\ln} \rightarrow \log_e$

$\boxed{\log} \rightarrow \log_{10}$

$\log_x$ or $\log_y$ or $\log_a$

Change of base formula: $\log_b x = \dfrac{\log_c x}{\log_c b}$

original base

different base

example:

$8^x = 2.62$

$\cancel{\log_8} \cancel{8}^x = \log_8 2.62$

$x = \log_8 2.62$

$x = \dfrac{\log_e 2.62}{\log_e 8}$

or

$x = \dfrac{\log_{10} 2.62}{\log_{10} 8}$

$x = \dfrac{\ln 2.62}{\ln 8}$

$x = \dfrac{\log 2.62}{\log 8}$

Quiz: Quiz #6 (Due 7/12 at 11:59pm)

Show completed problem | Submit Quiz

This Question: 1 pt | 8 of 16 (0 complete) | **This Quiz:** 16 pts possib

Solve the following exponential equation. Express the solution set in terms of natural logarithms or common logarithms. Then, use a calculator to obtain a decimal approximation for the solution.

$5^{x-1} = 682$

The solution set expressed in terms of logarithms is $\{\square\}$.
(Use a comma to separate answers as needed. Simplify your answer. Use integers or fractions for any numbers in the expression. Use **ln** for natural logarithm and **log** for common logarithm.)

Now use a calculator to obtain a decimal approximation for the solution.

The solution set is $\{\square\}$.
(Use a comma to separate answers as needed. Round to two decimal places as needed.)

$5^{x-1} = 682$ Goal: $x =$ something

$\cancel{\log_5} \cancel{5}^{x-1} = \log_5 682$

$x - \cancel{1} = \log_5 682$

$\quad +1 \qquad +1$

$x = 1 + \underbrace{\log_5 682}_{\frac{\ln 682}{\ln 5}}$ or $x = (\log_5 682) + 1$

or $x = \log_5 (682) + 1$

$x = 1 + \frac{\ln 682}{\ln 5}$ or $x = 1 + \frac{\log 682}{\log 5}$

$5^{x-1} = 682$

$\underbrace{\ln}_{\log_e} 5^{x-1} = \ln 682$

base 5

different bases $\Rightarrow$ don't cancel

$x + 5 = 12$

$\quad -2 \quad -2$

don't cancel

$\ln 5^{x-1} = \ln 682$

$\frac{(x-1)\cancel{\ln 5}}{\cancel{\ln 5}} = \frac{\ln 682}{\ln 5}$

$x - \cancel{1} = \frac{\ln 682}{\ln 5}$

$\quad +1 \qquad +1$

$x = 1 + \frac{\ln 682}{\ln 5}$ $x \approx 5.05$

same

Quiz: Quiz #6 (Due 7/12 at 11:59pm)

Show completed problem

This Question: 1 pt

15 of 16 (0 complete)

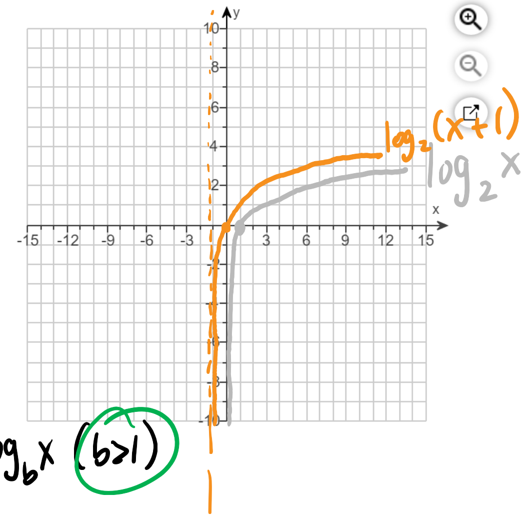
This Quiz

Graph the inequality.

$y \geq \log_2(x+1)$

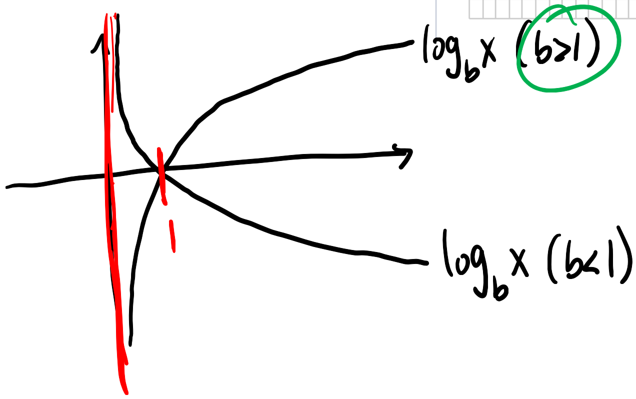
Use the graphing tool to graph the inequality.

Click to enlarge graph



$y = \log_2(x+1)$

horizontal shift left by 1



Test #3: $y \geq \log_2(x+1)$

Final Exam: $y < 2^{x+1}$

graph the inequality