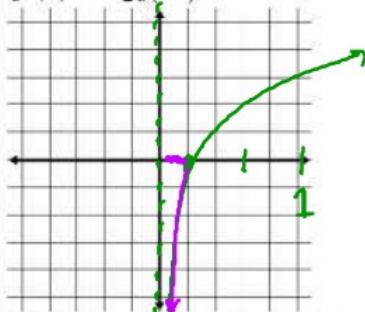


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Sketch a graph of the following functions

$$f(x) = \log_3(5x)$$



- 1) Determine the vertical asymptotes

$$x = 0$$

- 2) Determine the x-intercept

$$0 = \log_3(5x) \quad | -\log_3 \quad \frac{1}{5} = 5x \\ 3^0 = 5x \quad | :5 \quad \frac{1}{5} = x$$

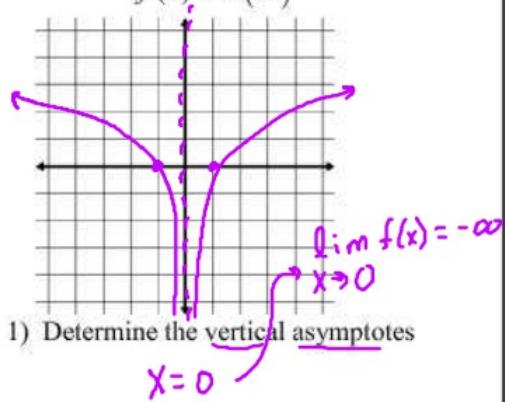
- 3) Determine the domain and range

- 4) Intervals of Increase or Decrease

- 5) Determine the end behavior

- 6) Intervals of Concavity

$$f(x) = \ln(x^4)$$



- 1) Determine the vertical asymptotes

$$x = 0$$

- 2) Determine the x-intercept

$$0 = \ln x^4 \quad | e^0 = x^4 \\ \sqrt[4]{1} = \sqrt[4]{x^4} \\ \pm 1 = x$$

- 3) Determine the domain and range

- 4) Intervals of Increase or Decrease

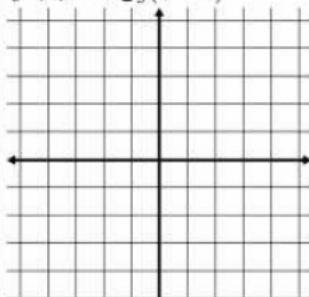
- 5) Determine the end behavior

$$\lim_{x \rightarrow \pm\infty} f(x) = \infty$$

- 6) Intervals of Concavity

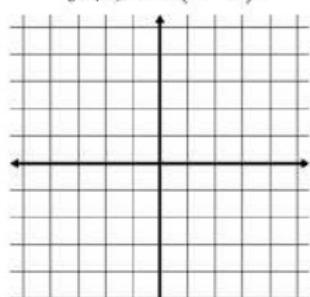
Sketch a graph of the following functions

$$f(x) = \log_3(x - 4)$$



- 1) Determine the vertical asymptotes

$$f(x) = \ln(4 - x)$$



- 1) Determine the vertical asymptotes

- 2) Determine the x-intercept

- 2) Determine the x-intercept

- 3) Determine the domain and range

- 3) Determine the domain and range

- 4) Intervals of Increase or Decrease

- 4) Intervals of Increase or Decrease

- 5) Determine the end behavior

- 5) Determine the end behavior

- 6) Intervals of Concavity

- 6) Intervals of Concavity

Chapter 3: Exponential, Logistic, and Logarithmic Functions
3.5: Equation Solving and Modeling

What you'll Learn About

Find the exact solution algebraically, and check it by substituting into the original equation.

$$A) \left(\frac{1}{4}\right)^x = \frac{1}{16}$$

$$\begin{aligned} x &= 2 \\ \left(\frac{1}{4}\right)^{(2)} &= \left(\frac{1}{4}\right)^{(2)} \\ x &= 2 \end{aligned}$$

$$B) \frac{20\left(\frac{1}{2}\right)^{x/3}}{20} = \frac{5}{20}$$

$$\begin{aligned} \left(\frac{1}{2}\right)^{x/3} &= \frac{1}{4} \\ \left(\frac{1}{2}\right)^{x/3} &= \left(\frac{1}{2}\right)^2 \quad (3)\frac{x}{3} = 2(3) \\ x &= 6 \end{aligned}$$

$$C) \frac{2(3)^{x/2}}{2} = \frac{6}{2}$$

$$\begin{aligned} 3^{x/2} &= 3^1 \\ (2) \frac{x}{2} &= 1(2) \\ x &= 2 \end{aligned}$$

$$D) \frac{2(3)^{-x/2}}{2} = \frac{54}{2}$$

$$\begin{aligned} 3^{-x/2} &= 27 \\ 3^{-x/2} &= 3^3 \quad (-2) - \frac{x}{2} = 3(-2) \\ x &= -6 \end{aligned}$$

$$E) \log x = 5$$

$$\log_{10} x = 5$$

$$10^5 = x$$

$$100000 = x$$

$$F) \log_2(x-4) = 3$$

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

$$2^3 = x-4$$

$$8 = x-4$$

$$12 = x$$

$$2.03^x = 5$$

$$\log_{2.03} 2.03^x = \log_{2.03} 5$$

$$x = \log_{2.03} 5$$

$$e^{\ln(x+3)} = e^2$$

$$x+3 = e^2$$

Solve each equation algebraically

$$A) 2.03^x = 5$$

$$2.03^x = 5 \quad \left\{ \begin{array}{l} 2.03^x = 5 \\ \ln 2.03^x = \ln 5 \\ x \ln 2.03 = \ln 5 \\ x = \frac{\ln 5}{\ln 2.03} \end{array} \right.$$

$$B) \frac{50(e)^{0.03x}}{50} = 500$$

$$e^{0.03x} = 10$$

$$\left\{ \begin{array}{l} \ln e^{0.03x} = \ln 10 \\ .03x = \ln 10 \\ x = \frac{\ln 10}{.03} \end{array} \right.$$

$$C) 2\ln(x+3) + 6 = 10$$

$$\begin{array}{r} -6 -6 \\ \hline 2\ln(x+3) = 4 \\ \hline 2 \end{array}$$

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

$$e^2 = x+3$$

$$e^2 - 3 = x$$

$$D) 2 - \log(x+3) = 10$$

$$\begin{array}{r} -2 -2 \\ \hline -\log(x+3) = 8 (-1) \end{array}$$

$$\log_{10}(x+3) = -8$$

$$10^{-8} = x+3$$

$$\boxed{\frac{1}{100000000} - 3 = x}$$