

Rational Functions

Introductory Example

A clothes dryer is purchased for \$750, and electricity to run it costs approximately \$95 per year. Write a function that represents the average cost per year of operating the dryer. Graph this function in an appropriate window.

Things to know about Rational Functions

General form:

Domain of a rational function:

Zeros of a rational function:

Vertical Asymptotes:

Horizontal Asymptotes:

Example to Practice with

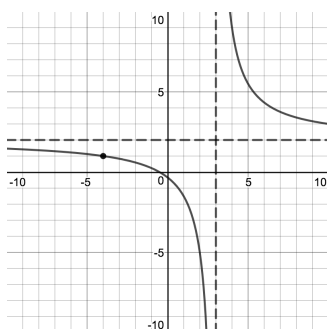
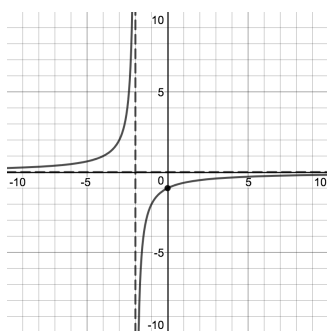
$$f(x) = \frac{3x-2}{x-1}$$

Examples

For the following function identify the domain and write equations for all the asymptotes. Verify your answer by graphing.

$$f(x) = \frac{2x+1}{x^2-16}$$

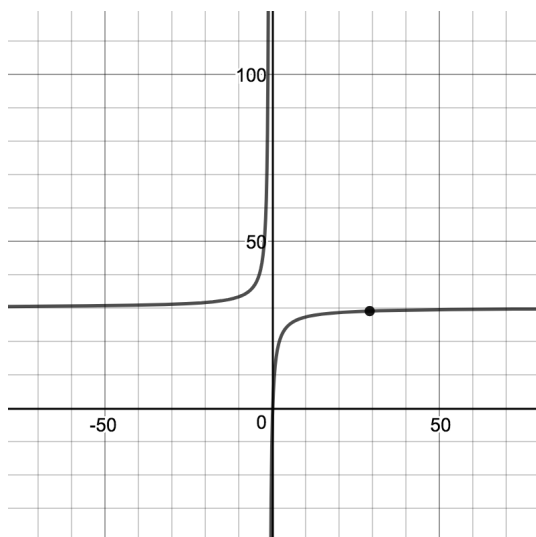
Find an equation for the following rational equations.



A company that assembles bicycles has determined that a new employee can assemble $M(d)$ bicycles per day after d days of on-the-job training, where $M(d) = \frac{100d^2}{3d^2+10}$. After how many days of training would an employee be able to assemble 25 bicycles per day?

Problem Set 1

- Determine an equation for the rational function that has:
 - $f(x)$ has a zero at $x = 2$
 - $f(x)$ has a vertical asymptote at $x = -1$
 - $f(x)$ has a horizontal asymptote at $y = 3$
- A patient is being treated for a chronic illness. The concentration $C(x)$ in g per mL of a certain medication in the patient's bloodstream x weeks after taking the medication is approximated by $C(x) = \frac{8x^2-31x+35}{4x^2-16x+17}$. During what week is the largest concentration in the patient's bloodstream? How much is in their bloodstream during that week? As time passes how much medication will be in the patient's bloodstream?
- Answer the following questions about the rational function $f(x) = \frac{x^2+3x-18}{x^2-4}$. Identify the:
 - Domain
 - Vertical Asymptote
 - Horizontal Asymptote
 - Zeros
 - y -intercept
- The cost C in millions of dollars of removing $x\%$ of pollutant from a lake is given by $f(x) = \frac{50x}{100-x}$, where $0 \leq x \leq 100$. Use this information to answer these questions:
 - Evaluate $f(60)$ and interpret what it means in context of the problem
 - If a company has 25 million dollars to spend how much pollutant can they remove?
 - What amount of money does a company need to have in order to remove 95% of the pollution?
 - A current law states that in order for a state to receive federal funding at least 10% of the funding must be utilized clean water ways. If the government is funding 900 million to a certain state how much pollutant can they remove from the lake?
- The number of random facts a person can learn depends on the number of minutes, m , they spend studying. This is represented by the following graph. Use the graph to find an equation that represents the number of facts a person can learn.



Problem Set 2

1. A company that produces telephones has determined that the monthly fixed cost is \$12,000 and it costs \$30 to manufacture each telephone. Use this information to answer the following questions.
 - Write a function that represents the average cost per telephone.
 - Determine an appropriate domain for the function.
 - As the number of telephones the company produces increases, what does the average cost become?
2. A scientist is studying the temperature in a certain region of a remote planet. She approximates the temperature, T in degrees Celsius in that region x years after the planet's origin to be the following $T = \frac{3x^2 - 13x + 8}{x^2 - 4x + 8}$. In what year was the temperature the coolest? What was the coolest temperature? Does the temperature of the planet ever level off? If so, what does the temperature tend to?