

Applications of Rational Functions

Objectives:

- Be able to apply knowledge and answer questions about rational functions within the context of an application.

1. The total number of inches of rain during a particular storm can be modeled by the equation $r(t) = \frac{4t}{t+8}$ where r is the amount of rain (in inches) and t is the length of the storm (in hours).

a) What is a reasonable domain for this function? Why?

$(0, \infty)$ cannot have a storm of negative hrs

b) How much rain has fallen after 1 hour? 3 hours?

$$r(1) = \frac{4(1)}{1+8} = \boxed{.444 \text{ in}} \quad r(3) = \frac{4(3)}{3+8} = \boxed{1.09 \text{ in}}$$

c) How long has it been storming, when 2 inches of rain have fallen? (calc to find intersection)

$$a = \frac{4t}{t+8} \quad y_1 = \frac{4t}{t+8} \quad \text{look for intersection} \quad \boxed{8 \text{ hrs}}$$

$$y_2 = 2$$

d) What is the average rate of change between hour 1 and hour 3? Hour 3 and hour 5? What is happening to the amount of rainfall as time goes on? Explain.

average rate of change
(slope between 2 points)

~~$f(t) = \frac{4t}{t+8}$~~

$$r(1) = .444 \quad r(3) = 1.09$$

$$= \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{1.09 - .444}{3-1} = \frac{.646}{2} = \boxed{.323 \text{ in/hr}}$$

$$= \frac{f(b) - f(a)}{b-a}$$

$$r(3) = 1.09 \quad r(5) = \frac{4(5)}{5+8} = 1.538$$

$$= \frac{1.538 - 1.09}{5-3} = \frac{.448}{2} = \boxed{.224 \text{ in/hr}}$$

2. You are organizing an end of the season banquet. The banquet hall rental charges \$200 plus an addition \$12 per plate.

a) Write an equation that would represent the **average cost per person**.

$$C(p) = \frac{200 + 12p}{p}$$

b) Find the average cost per person if 50 people attended.

$$C(50) = \frac{200 + 12(50)}{50} = \boxed{\$10 \text{ per person}}$$

c) Find the average cost per person if 100 people attended.

$$C(100) = \frac{200 + 12(100)}{100} = \boxed{\$14 \text{ per person}}$$

d) How many people need to attend to make the cost less than \$15 per person?

$$15 > \frac{200 + 12(p)}{p} \quad \boxed{67 \text{ people}}$$

* use calc to find the intersection

e) What is the average rate of change between 1 plate and 3 plates? 3 plates and 5 plates? 8 plates and 10 plates? What is happening to the average cost per plate as the number of attendees goes up? Explain.

$$C(1) = 212$$

$$C(3) = \frac{200 + 12(3)}{3} = 78.67$$

$$\frac{78.67 - 212}{3 - 1} = -66.67 \text{ dollars per person}$$

$$C(3) = 78.67$$

$$C(5) = \frac{200 + 12(5)}{5} = 52$$

$$\frac{52 - 78.67}{5 - 3} = -13.34 \text{ dollars per person}$$

$$C(8) = \frac{200 + 12(8)}{8} = 37$$

$$C(10) = \frac{200 + 12(10)}{10} = 32$$

$$\frac{32 - 37}{10 - 8} = -2.5 \text{ dollars per person}$$