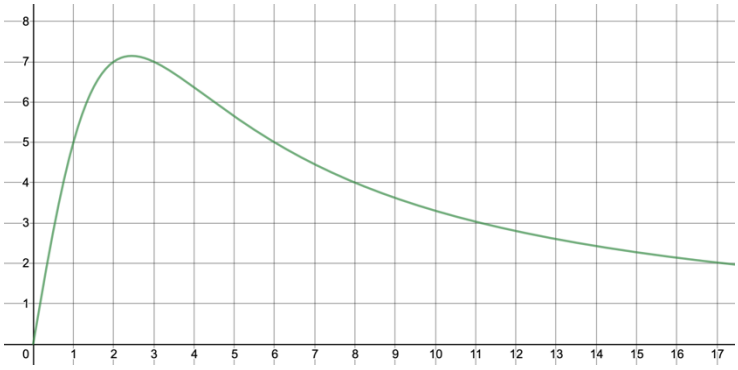
How Much Anesthesia Should the Patient Get?

When patients undergo surgery, the anesthesiologist must administer the right amount of drugs to the patient to keep them sedated during the procedure. The well-being of the patient depends on the doctor's ability to predict how long the anesthesia will stay in the patient's bloodstream. How does he or she do this?

1. What do you think will happen if a patient receives too little or too much anesthesia?

2. The concentration of anesthesia in a person's blood stream can be modeled by $C(t) = \frac{35t}{t^2+6}$ where C is given as a percent and t is in hours. A graph of C is shown below.
   a. What do you notice about the graph? What do you wonder?



   b. What is the concentration of anesthesia after a half hour?

   c. What is the concentration of anesthesia after 24 hours? 48 hours?

3. Anesthesia is considered effective at a concentration at or above 5%. How long should the surgeon wait to start the surgery? How many hours is the anesthesia effective?

4. After many, many hours, what do you anticipate will happen to the concentration of anesthesia?

5. For large values of t, which grows faster: the numerator of $C(t)$ or the denominator of $C(t)$?

6. How is your answer in question 5 related to the long-run effect of anesthesia in your body?

Lesson 2.5 –Rational Functions and End Behavior

QuickNotes

Check Your Understanding

1. Find the horizontal asymptote of each function or explain why it does not exist.
   a. $f(x) = \frac{3x^2-5x+2}{2x^6-8x}$

   b. $g(x) = \frac{(x-2)^3(x+4)}{(x+5)(x-2)}$

2. Write the equation of a rational function g where $\lim_{x\to\infty} g(x) = \frac{4}{5}$

3. A rare species of insect was discovered in the Amazon Rainforest. To protect the species from extinction, entomologists transferred a certain number of insects to a protected area. The population P of the new colony t days after the transfer is given by $P(t) = \frac{50+25t}{2+0.01t}$.
   a. Find the y-intercept of $P(t)$. Interpret this value in the context of this problem.

   b. Find $\lim_{t\to\infty} P(t)$ and interpret your answer in the context of this problem.

4. (Multiple Choice) The graph of $f(x) = \frac{4x^7-3x^5+21x-17}{-2x^3+6x^2-3x+1}$ has the same end behavior as

   (A) $y = 4x^7$ (B) $y = x^4$ (C) $y = -2x^7$ (D) $y = -2x^4$