**Activity 4.3.4 – Applications of Rational Functions**

1. Below is a list of the average yearly cost for electricity for common household appliances.

|  |  |
| --- | --- |
| Appliance | Average Cost/Year in Electricity |
| Home Computer | $9 |
| Television | $13 |
| Microwave | $13 |
| Dishwasher | $51 |
| Clothes Dryer | $75 |
| Washing Machine | $79 |
| Refrigerator | $92 |

1. Assume that a new washing machine costs $715; determine the total annual average cost for a refrigerator that lasts for 15 years. The only costs associated with the washing machine are its purchase price and electricity.
2. Write a function that gives the annual average cost of a washing machine as a function of the number of years you own the washing machine.

1. Determine the asymptotes of this function?
2. Explain the meaning of the horizontal asymptote in terms of the washing machine.
3. If a company offers a washing machine that costs $1100, but says that it will last at least 25 years, determine the total cost of the washing machine for 25 years. Assume no repairs were needed. Is the washing machine worth the difference in cost? Explain.
4. The function describes the concentration of a drug in the blood stream over time. is measured in micrograms per liter and *t* is measured in hours.
   1. Use a graphing calculator to sketch the graph of the function over the first 10 hours after the dose is given. Label and scale the axes.



* 1. When will the highest concentration of drug be reached and what is the amount in the patient’s bloodstream at that time?
  2. How long does it take for the concentration to drop below 0.2 mg/L?
  3. What are the asymptotes of the rational function ?
  4. What is the meaning of the horizontal asymptote within the context of the problem?

1. The rabbit population on Bishop’s Farm can be found by the function , where is the time in months since the beginning of the year.
2. Determine the asymptotes of this function?
3. Explain the meaning of the horizontal asymptote in terms of the rabbit population.
4. Explain the meaning of the vertical asymptote in terms of the rabbit population.
5. You are traveling in your car for 200 miles.
   1. How long will the trip take if you average 30 miles per hour, 55 miles per hour, or 65 miles per hour?
6. Write a function *f*(*t*) that describes the time it takes to travel 200 miles as a function of your speed *s*.
7. Sketch the graph of this function. Label and scale the axes.



1. What does the graph tell you about the time it takes you to travel depending on the speed of the car?

1. A rocket fired upward from the surface of the earth with an initial velocity *v* (in meters/second) will attain a maximum height *h* (in meters) according to the formula

where *r* is the radius of the earth, about 6.4 \*106 meters, and *g* is 9.8m/s2.

1. Find *h*(1000). Interpret the result in terms of the problem and convert it from meters to miles.
2. Find *h*(5000). Interpret the result in terms of the problem and convert it from meters to miles.
3. Use your graphing calculator to graph this function in the first quadrant since *h* and *v* will be positive. Let the interval for *v* be [0, 12000]. You should see a vertical asymptote. Identify the vertical asymptote from the graph.
4. Do all rockets we launch come back to earth or do some escape the earth’s gravitational pull?
5. What might be the significance of the velocity where you have the vertical asymptote?
6. An aluminum can is to be constructed to have a volume of 298 cm3. Using a graphing calculator, find the dimensions of the can that will minimize the amount of material?

Surface Area = 2π*r*2 + 2π*rh* Volume = π*r*2*h*

where *r* is the radius of the circle and *h* is height of can.