

Read the following real life applications. Use the rational expression to answer the problems.

1. **Brakes** The braking distance of a car can be modeled by $d = s + \frac{s^2}{20}$ where d is the distance (in feet) that the car travels before coming to a stop, and s is the speed at which the car is traveling (in miles per hour). Find the speed that results in a braking distance of 75 feet.

2. **Population Density** The population density in a large city is related to the distance from the center of the city. It can be modeled by

$$D = \frac{5000x}{x^2 + 36}$$

where D is the population density (in people per square mile) and x is the distance (in miles) from the center of the city. Find the distance where the population density is 400 people per square mile.

3. **Average Cost** A greeting card manufacturer's profit can be modeled by the equation

$$P = 10c + \frac{360}{c}$$

Where P = profit (in thousands) and c = the number of cards produced (in thousands). How many cards (in thousands) does the company have to produce to make 120 thousand dollars?

4. The following is the equation that represents the cost of producing a TV commercial:

$$c = \frac{3x^3 - 12x^2}{x^2 - x - 12}$$

where c = the cost of producing the commercial (in thousands) and x = the number of seconds the commercial lasts.

a) Simplify the expression above.

b) How much does a TV commercial cost if it is 30 seconds long?