

Solutions

Quiz 3: Section 1.4-1.5

1. A car wash operator pays \$35,000 for a franchise, then spends \$10 per car wash, which costs the consumer \$15. Find the profit function for the car wash operator.

$$C(q) = 10q + 35000$$

$$R(q) = 15q$$

$$\begin{aligned}\pi(q) &= R(q) - C(q) = 15q - (10q + 35000) \\ &= 5q - 35000\end{aligned}$$

2. The *equilibrium price and quantity* is similar to the break-even point for profit. Given a supply curve and a demand curve, the *equilibrium point* is where the two curves intersect; that is, where the two quantities are equal to each other. For a certain good, the supply curve is given by $q = 100 - 2p$ and the demand curve is given by $q = 3p - 50$. Find the equilibrium price, p , and quantity, q .

$$100 - 2p = 3p - 50$$

$$150 = 5p$$

$$p = 30$$

$$q = 100 - 2(30) = 100 - 60 = 40$$

3. Assume that the number of zebra mussels in a bay is growing exponentially. Let $P(t)$ represent the number of zebra mussels as a function of the number of years since 2010. So a function modeling the population is of the form $P(t) = P_0 a^t$. Given that there were 2700 mussels at the start of 2010 and 3186 at the start of 2011,
- (a) Find the base, a . You may round your answer to ~~three~~ ^{two} decimal places.
- (b) Find the relative growth rate, r .

$$(a) P_0 = 2700$$

$$P(1) = 3186$$

$$3186 = 2700 a^1$$

$$a = \frac{3186}{2700} \approx 1.18$$

$$(b) r = a - 1$$

$$= 1.18 - 1$$

$$= .18 = 18\%$$