

Math 165 Ln-Exp Worksheet

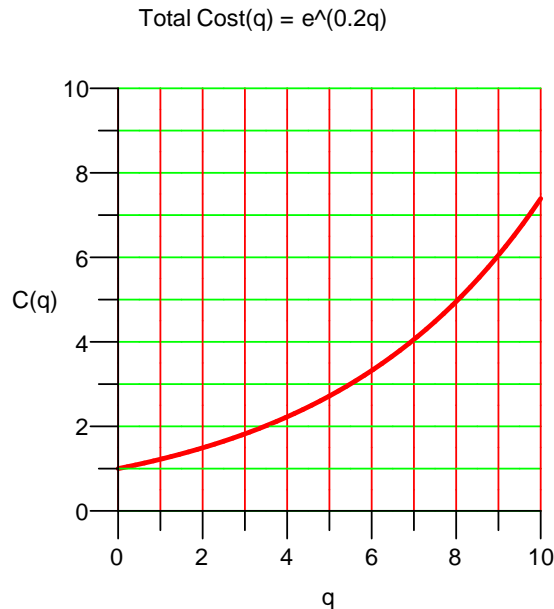
1. 9e.4.3.Pr61. The cost $C(x)$ of producing the first x units of a commodity is $C(x) = e^{0.2x}$.

a. Find the marginal cost $\frac{dC}{dx}$.

b. Determine the level of production x for which the marginal cost equals average cost
 $A(x) = \frac{C(x)}{x} = \frac{dC}{dx}$.

c. Determine the level of production x for which the average cost $A(x)$ is minimized.

d. Here is the graph of $C(x) = e^{0.2x}$ (I have changed x to q).



For various values of q , use a straight edge or ruler to represent lines through $O = (0, 0)$ and $(q, C(q))$. The slope of these lines is $C(q)/q = A(q)$. As you move q to the right, the slope of the line from 0 to $(q, C(q))$ decreases and then increases. Which of these lines has minimal slope? How does your answer correspond to the result in parts (b.) and (c.)?

2. 9e.4.2.Pr55.Variation. **Worker Efficiency.** Worker efficiency is measured by (hourly) output Q and is given by a formula of the form

$$Q(t) = 500 - Ae^{-kt},$$

where t is the “experience” measured by the time in months after initial training.

- a. What is $\lim_{t \rightarrow \infty} Q(t)$?
- b. It is observed that a newly trained worker has an hourly output of 300 units, and that after 6 months, a worker has an hourly output of 410 units. Find the function of the form

$$Q(t) = 500 - Ae^{-kt},$$

which fits the data.

Hint: What is the form of the function $F(t) = 500 - Q(t)$?

3. 9e Example 4.3.14 Variation. Total net profit comes from wheat, steel, and oil.

At a certain time,

The profit W from wheat accounts for 20% of net profit and is increasing at a rate of 2%.

The profit S from steel accounts for 30% of net profit and is increasing at a rate of 3%.

The profit O from oil accounts for 50% of net profit and is decreasing at a rate of 5%.

At what percentage rate is total net profit increasing or decreasing?

Hint: When the data is taken, find

- a. $\frac{W}{W + S + O} =$
- b. $\frac{dW}{dt} =$

4. 9e.4.3.Pr66. Money is deposited in a bank offering interest at an annual rate of 6% compounded continuously (CC). Find the percentage rate of change with respect to time.

5. 9e.4.3.Pr33. If $g(u) = \ln(u + \sqrt{u^2 + 1})$, find $g'(u)$. Simplify your answer.