Business Functions

MAC 2233

Homework

- Review of lines
  - p. 39 problems 5, 11, 17, 23, 29, 31
- Review of exponents
  - p. 303 problems 5-27 odd
- Review of logarithms
  - p. 320 problems 1-8, 13-33 odd

Cost Function

- Returns the amount of money expended in producing *x* products.
- The _____associated with the production are represented by the _____
  - The amount of money that must be spent if _____

Example

Suppose the monthly cost associated with manufacturing toasters is given by

a) Identify the fixed costs.
b) Find the costs involved with producing 100 items.
c) Find the cost of producing the 100th item.

a) Identify the fixed costs

- The fixed costs associated with this venture are _____.
- _____, we still must pay _____to support the business.

b) Find the costs involved with producing 100 items.

- It will cost _____to produce _____.

c) Find the cost of producing the 100th item.

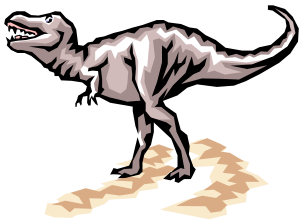
- So, it will cost _____.

Example

- Suppose that the weekly fixed cost associated with producing stuffed dinosaur toys is $____ and each unit produced costs $_____. Develop a cost function to model this situation.

Solution

- The weekly cost function for producing stuffed dinosaurs is



Homework

- p. 11 problem 61
- p. 41 problem 37
- p. 60 problem 41

Revenue Function

- Returns the amount of money obtained by selling *x* units of a product.
- Calculated by multiplying _____ _____for each item by _____.

Demand function

- Provides a relationship between _____ _____ (price) and the number of items purchased by consumers (_____).
- *p* is _____ and *x* is the _____.

Revenue function revisited

- The *p* is the _____!
- The *x* is the variable representing _____ _____.

Example

Through data analysis, you have discovered that the demand equation for the sale of your ice cream treat is

Form the Revenue equation.

Solution

Example

Suppose that you have found _____ will purchase one cupcake when you charge $____ per cupcake but only _____ will purchase one when you charge $_____per cupcake. Form your revenue equation.

Solution

- First we form the _____.
- We identify two points from the problem:

- where p is _____ and x is _____
- Then form a line between these two points
- So we first have to calculate the _____!

Solution

Solution

Solution

- So the revenue equation is

Important note:

- How do you know which number is *x* and which is *y* in your ordered pairs?
- _____!
- That's why we use _____
  - Cost is a _____ of _____ so *x* is the _____and *y* is the _____.
  - Price is a _____ of demand so *x* is the _____ _____ and *y* is the _____.
    - I could reverse this dependency and then I would reverse the ordered pairs … look at what you need for the problem.

Homework

- p. 11 problems 57, 59, 73
- p. 56 problem 1
- p. 60 problem 43
- p. 304 problem 41

Profit

- Profit is the amount of money you take in (_____) minus the amount of money you spend (_____)

- Capital *P* for _____, lower case *p* for _____.

Example

Suppose you have discovered that the cost associated with manufacturing *x* coffee mugs is

and the revenue is

Form the profit function.

Solution

Example

Suppose you find that _____ will buy your printers at $___ per printer but only _____ people will buy them at $___ per printer. If it costs you $_ per printer to manufacture the printers and you have a monthly overhead of $_____, determine your monthly profit from manufacturing and selling *x* printers.

Solution

- To get to profit, we need to form _____ _____!
- _____ is easiest …

Develop the _____ function:

- The _____ function is

- Now we need _____ …

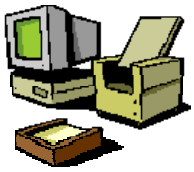
Forming the _____:

- The problem gives us two points

- where *x* is _____ and *p* is _____
- Use these points to construct a _____

Forming the _____:

- So the _____ equation is



Solution

- Now we can form the profit equation!

Homework

- p. 26 problems 39, 41, 47
- p. 60 problem 39

Break-even point

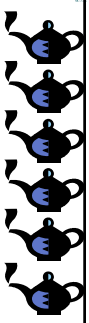
- If my profit is $0, _____ _____. This is the break-even point.
- To find it, set
- Or, equivalently, set

Example

Suppose your profit equation for your teapot business is

where x is in _____ and P is in _____. Find and interpret the break-even point. How many units will you need to sell to make a profit of $_____?

Find and interpret the break-even point.



- Find where the _____!
- Use the _____:
- Discard _____! Producing _____ will incur _____.

How many units will you need to sell to make a profit of $_____?

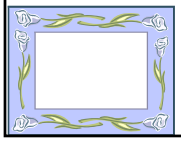
- Set the profit equal to _____... Remember, profit is in _____.
- Use the _____.

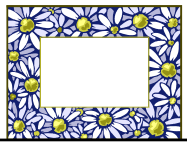
Conclusion

- You need to sell _____ to make a profit of $_____.

Example

- Your fixed costs associated with your picture frame business are $_____ per month and your variable costs are $_ per frame. If you sell frames for $___ each, find the monthly break-even point.

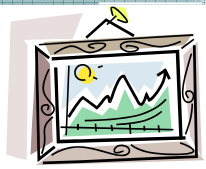




Solution

- Form the _____ equation:
- Form the _____ equation:

Solution



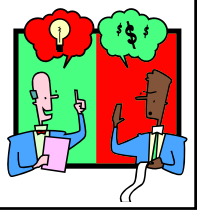
- Set them equal:
- You need to sell _____ to break even.

Homework

- p. 60 problem 52

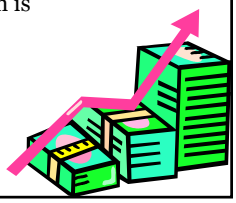
Average Business Functions

- The average ____ function gives the average ____ per _____.
- The average _____ function is



Average Business Functions

- The average _____ function is the average _____ _____.
- The average _____ function is



Average Business Functions

- Why isn't there an average _____ function?

Example

If your cost function for producing toy cars is

find the average cost of producing _____ cars. What is the average cost of producing _____ cars?

Solution

- Develop the average cost function
- Evaluate at _____ and _____

Solution

- It will cost _____ to produce _____toy cars and it will cost _____to produce _____ toy cars.

Supply and Demand

- We know how to figure out the _____ equation, which gives us a relationship between _____
- A _____ equation will give us a similar relationship between _____ _____

Supply and Demand

- In general, the demand curve is a _____ _____:

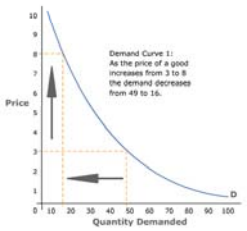


Image retrieved from http://www.bized.co.uk/learn/economics/markets/mechanism/interactive/demand1.gif, May 26, 2009

Supply and Demand

- In general, the supply function is an _____ _____:

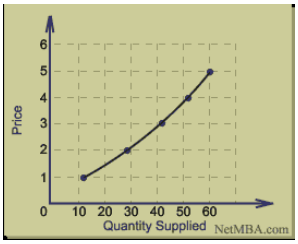


Image retrieved from http://www.netmba.com/images/econ/micro/supply/curve/supplycurve.gif, May 26, 2009

Equilibrium

- Where supply and demand are _____!

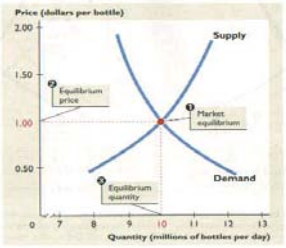


Image retrieved from http://www.webshells.com/college/grid7.jpg, May 26, 2009

Equilibrium

- A demonstration

Example

Through data analysis, you find that the demand curve for your new turbo-powered stethoscopes is

and the supply curve is

where *x* is in thousands. Find the equilibrium price.

Solution

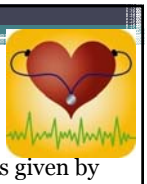
Set them _____!

Solution

- That means we must produce _____ stethoscopes to reach _____!
- So what's the price?
- Plug _____ into either equation to solve for the price!

- We should _____ so that there is _____.

Example



The demand for your cardiac monitors is given by

and the supply function is

where x and p are in thousands. What is the equilibrium price?

Solution

- Set them _____!

Solution

- We can't have _____ _____, so the answer must be that producing _____.
- Now get the price!

Example

- Plug ___ into either equation:
- The equilibrium price is $_____. Thus, charging _____ _____.

Homework

- p. 61 problems 45, 47, 49
- p. 322 problem 65

Compound Interest

The amount accumulated in an account bearing interest compounded n times annually is

where P =
r =
t =

Example

Suppose you invest $_____ in an account paying 8% interest _____. How much will you have in _____ if you do not withdraw any funds?

Solution

- After _____, you would have about $_____ in the account , assuming you never added more to your deposit… _____ _____!

Continuously Compounded Interest

The amount accumulated in an account bearing interest compounded *continuously* is

where P =
r =
t =

Example

Suppose you invest $_____ in an account paying __% interest compounded continuously. How much will you have in _____ if you do not withdraw any funds?

Solution

- After 45 years, you would have about $_____ in the account , assuming you never added more to your deposit. That's about $_____ _____ _____.

Homework

- p. 304 problems 35, 49, 61, 71, 73
- p. 321 problems 43, 45, 47

Exponential Growth & Decay

- If a population grows or decays exponentially, the number of members in the population is given by

where Q_0 =
k =

t =

- It's the same formula as for _____ _____!

Example

- Once the initial publicity surrounding the release of a new book is over, sales of the hardcover edition tend to _____. At the time publicity was discontinued, a certain book was experiencing sales of _____ copies per month. One month later, sales of the book had dropped to _____ copies per month. What will the sales be after one more month?

From *Calculus for Business, Economics, and the Social and Life Sciences* 10th ed. by Hoffmann & Bradley, 2007, p. 350, problem 22.

Solution

- So, Q_0 = _____ and we have the point (_, _____)

Solution

- So the equation is:
- Now, we can answer the question:
- In one more month, we expect the sales _____ _____.

Homework

- p. 304 problems 43, 63, 69
- p. 321 problem 51
- p. 350 problems 21, 23

Regression

A regression line is a line that provides _____ _____.

The _____, *r*, measures the _____ of that relationship.

If _____, there is a perfect fit.

Example

- The following chart shows total January retail inventories in U.S. department stores in 2000, 2002, and 2004 (_____):

Year *t*			
Inventory ($ Billion)			

- Find the regression line (round coefficients to two decimal places) and use it to estimate January retail inventories in 2001.

From *Applied Calculus*, 4th ed. by Waner & Costenoble, 2007, p. 90, problem 18.

Regression

A regression curve is the curve that provides ____ _____.

R^2, measures _____.

$$0 \le R^2 \le 1$$

If _____, there is a perfect fit.

Example

- The following table shows the average price of a two-bedroom apartment in uptown New York City from 1994 to 2004 (_____):

Year t						
Price ($ Million)						

- Use exponential regression to model the price as a function of time since 1994. Extrapolate your model to estimate the cost of a two-bedroom uptown apartment in 2005.

From *Applied Calculus*, 4th ed. by Waner & Costenoble, 2007, p. 142, problem 94.

Homework

- p. 14 problem 81
- p. 27 problem 51, 65
- p. 41 problems 39, 43, 47, 58
- p. 57 problems 7, 9, 11, 13, 15, 27, 37