CMA Students Newsletter (For Foundation Students)

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Paper 1: Fundamentals of Economics and Management (FEM)

THEORY OF PRODUCTION

What is Production?

Production is basically an activity of transformation, which connects factor inputs and outputs

What is Production?

The process of transforming inputs into outputs can be any of the following kinds:

- Change in the Form(Raw material transformed to finished goods)
- Change in Place(Supply chain, Factory to Retailer)

What is Production?

- With these three kinds of transformations, usability of the good or materials increases.
- Production is an activity that increases consumer usability of goods and services.

Basic Concepts of Production Theory: Classifications of Inputs

(i) labour
(ii) capital
(iii) land
(iv) raw materials
(v) (v) time.

These variables are measured per unit of time and hence referred to as flow variables.

Entrepreneurship has been added as part of the production inputs, though this can be measured by the managerial expertise and the ability to make things happen.

Basic Concepts of Production Theory

- An input is a good or service that goes into the production process. As economists refer to it, an input is simply anything which a firm buys for use in its production process.
- An output, on the other hand, is any good or service that comes out of a production process.
- Inputs are considered variable or fixed depending on how readily their usage can be changed

- **Fixed input**

  – An input for which the level of usage cannot readily be changed

  - In **economic sense**, a fixed input is one whose supply is inelastic in the short run.

  - In **technical sense**, a fixed input is one that remains fixed (or constant) for certain level of output.

- **Variable input**

- A variable input is one whose supply in the short run is elastic, example, labour, raw materials, and the like. Users of such inputs can employ a larger quantity in the short run.

- Technically, a variable input is one that changes with changes in output. In the long run, all inputs are variable.

- **Short run**

  – At least one input is fixed

  – All changes in output achieved by changing usage of variable inputs

- **Long run**

  – All inputs are variable

  – Output changed by varying usage of all inputs

Production Function

- A tool of analysis used in explaining the input-output relationship.
- It describes the technical relationship between inputs and output in physical terms.
- In its general form, it holds that production of a given commodity depends on certain specific inputs.
- In its specific form, it presents the quantitative relationships between inputs and outputs.
- A production function may take the form of a schedule, a graph line or a curve, an algebraic equation or a mathematical model.
- The production function represents the technology of a firm.

Basic Concepts of Production Theory

- **Production function**

  – Maximum amount of output that can be produced from any specified set of inputs, given existing technology

- **Technical efficiency**

  – Achieved when maximum amount of output is produced with a given combination of inputs

Economic efficiency

– Achieved when firm is producing a given output at the lowest possible total cost

Production Function

Process 1	Process 2	Process 3
10	15	05
15	15	20

A process of production is technically efficient if it uses less of one factor and no more from the other factor, compare to any other process of production.

Production Function

- An empirical production function is generally so complex to include a wide range of inputs: land, labour, capital, raw materials, time, and technology.
- These variables form the independent variables in a firm's actual production function.
- A firm's long-run production function is of the form:
- Q = f(Ld, L, K, M, T, t)
- where Ld = land and building; L = labour; K = capital; M = materials; T = technology; and, t = time.
- For sake of convenience, economists have reduced the number of variables used in a
- production function to only two: capital (K) and labour (L). Therefore, in the analysis of
- input-output relations, the production function is expressed as:
- Q = f(K, L)
- Q = f(K, L)
- Increasing production, Q, will require K and L, and whether the firm can increase both K and L or only L will depend on the time period it takes into account for increasing production, that is, whether the firm is thinking in terms of the *short run or in terms of the long run*.
- Economists believe that the supply of capital (K) is *inelastic in the short run and elastic* in the long run.
- Thus, in the short run firms can increase production only by increasing labour, since the supply of capital is fixed in the short run. In the long run, the firm can employ more of both capital and labour, as the supply of capital becomes elastic over time.

Short Run Production

- In the short run, capital is fixed
  - Only changes in the variable labor input can change the level of output
- Short run production function $Q = f(L, \bar{K}) = f(L)$

Short Run Production

- **Total Product:** It gives maximum of output that can be produced at different levels of one input, assuming that the other input is fixed at a particular level.
- **Marginal Product:** Change in the output resulting from a very small change in one factor input, keeping the other factor inputs constant.
- **Average Product:** Total production for per unit of output.

Average & Marginal Products

- Average product of labor
  - $AP = Q/L$
- Marginal product of labor
  - $MP = \Delta Q/\Delta L$
- Average product of Capital
  - $AP = Q/K$
- Marginal product of Capital
  - $MP = \Delta Q/\Delta K$

Total, Average, & Marginal Products of Labor, K = 2

Number of workers (L)	Total product (Q)	Average product (AP=Q/L)	Marginal product (MP=ΔQ/ΔL)
0	**0**	—	—
1	**52**	52	52
2	**112**	56	60
3	**170**	567	58
4	**220**	55	50
5	**258**	51.6	38
6	**286**	47.7	28
7	**304**	43.4	18
8	**314**	39.3	10
9	**318**	35.3	4
10	**314**	31.4	-4

Law of Diminishing Returns or the Law of Variable Proportion

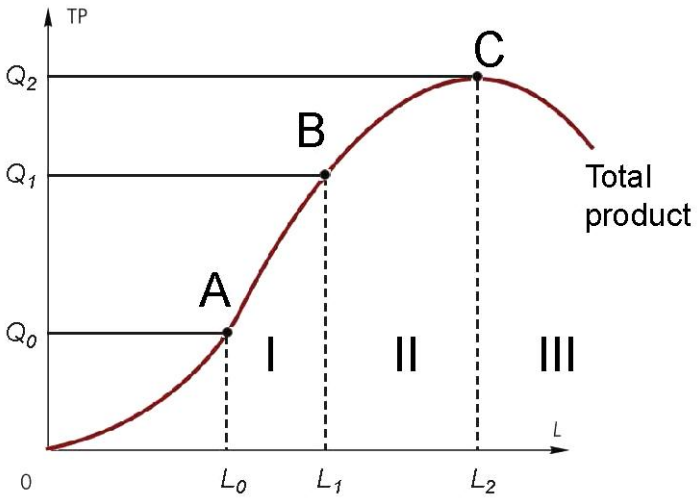
- The Shape of total product curve is determined by law of diminishing return.
- The law of diminishing returns, states that with a given state of technology if the quantity of one factor input is increased , by equal increment , the quantities of other factor inputs remaining fixed , the resulting increment of total product will first increase but decreases after a particular point.
- It states that as we go on employing more of one factor of production, other factor remaining same, the marginal productivity will diminish after some point.
- The shape of marginal product curve is therefore Inverted U Shaped.

Assumptions

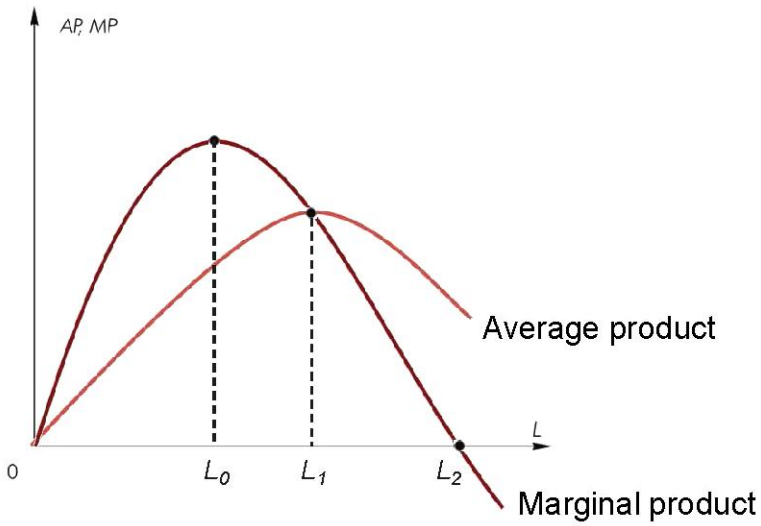
- State of technology is given.
- One factor of production must always be kept constant at a given level.
- The law is not applicable when two inputs are used in a fixed proportion.

Total, Average & Marginal Product Curves

Panel A



Panel B



Total, Average & Marginal Products

- At the point O, the factor input labor is equal to zero, the value of total product will also be zero. Obviously the value of MP and AP will be zero. So all the three curves, TP, AP and MP starts from the origin.
- TP curve is first convex from below and then concave.
- As long as TP curve is convex, MP is increasing. When TP curve is Concave , MP is decreasing.
- The point A on TP curve is called as point of inflexion. MP will be maximum corresponding to this point of the TP curve.
- AP is maximum at the point B, and also AP = MP.
- Corresponding to the maximum point of the TP curve, point C, MP is equal to Zero.
- To the left of Point C, total product is increasing and marginal product is positive. To the right of point C, TP curve is decreasing and marginal product is negative.
- Since the MP curve is must be decreasing when the average product is maximum, the MP curve reaches maximum before the AP curve.

Marginal and Average Product

- When AP is rising, MP is greater than AP
- When AP is falling, MP is less than AP
- When AP reaches it maximum, AP = MP

The Three Stages of Production

Stage I: Stage of Increasing Returns:

- AP is increasing and the MP is greater than the AP. Up to point B on the TP curve Stage I exist.
- AP is increasing, but MP is increasing first up to point A then decreasing.

Stage II: Stage of Decreasing Returns

- Both AP and MP is decreasing. But MP is positive.
- The portion of TP curve between B and C represents this stage.

Stage III: Stage of Negative Returns

- TP is diminishing and the MP is negative.
- The portion of TP curve which lies to the right of point C represents this stage.

The Three Stages of Production

In which stage would the rational producer like to operate?

In Stage I, MP and AP both are rising, and the MP is more than AP.

- A given increase in variable factor leads to a more than proportionate increase in the output.
- The producer is not making the best possible use of the fixed factor. A particular portion of fixed factor remains unutilized.

In Stage III, MP of variable factor is negative and the TP is also decreasing.

In Stage II, MP and AP both are falling and MP through positive, is less than AP.

- There is less than proportionate change in output due to change in labor force.
- Hence at this stage the producer will employ the variable factor in such a manner that the utilization of fixed factor is most efficient.

The Three Stages of Production

A good example of Diminishing Returns includes the use of chemical fertilizers- a small quantity leads to a big increase in output. However, increasing its use further may lead to declining Marginal Product (MP) as the efficacy of the chemical declines.

Law of Diminishing Return-Example

Number of Workers	Unit of product produced	Marginal Product
1	10	10
2	25	15
3	45	20
4	60	15
5	70	10
6	60	-10

Law of Diminishing Return -Example

It is with three workers that the farm production is most efficient because the marginal product is at its highest.

Beyond this point, the farm begins to experience diminishing returns and, at the level of 6 workers, the farm actually begins to see decreasing returns as production levels decline, even though costs continue to increase.

Law of Diminishing Return -Example

In this example, the number of workers changed, while the land used, seeds planted, water consumed, and all other inputs remained the same.

If more than one input were to change, the production results would vary and the law of diminishing returns may not apply if all inputs could be increased.

Paper 2: Fundamentals of Accounting (FOA)

ACCOUNTING FOR BILL OF EXCHANGE

❖ According to section 5 of Negotiable Instrument Act,

– A Bill of Exchange is an instrument in writing containing an unconditional order, signed by the maker, directing a certain person to pay a sum of money only to or to the order of a certain person or to the bearer of the instrument.

❖ Features:

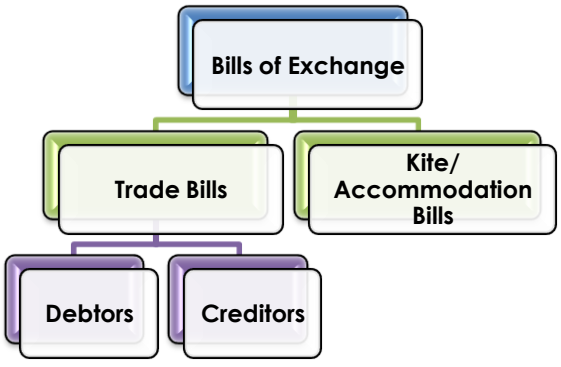
Based on this definition the **following features of a bill of exchange are** noticed:

- It's an instrument in writing.
- It contains an unconditional order.
- It's signed by the maker.
- It's drawn on a specific person
- There is an order to pay a specific sum of money
- It must be dated and stamped

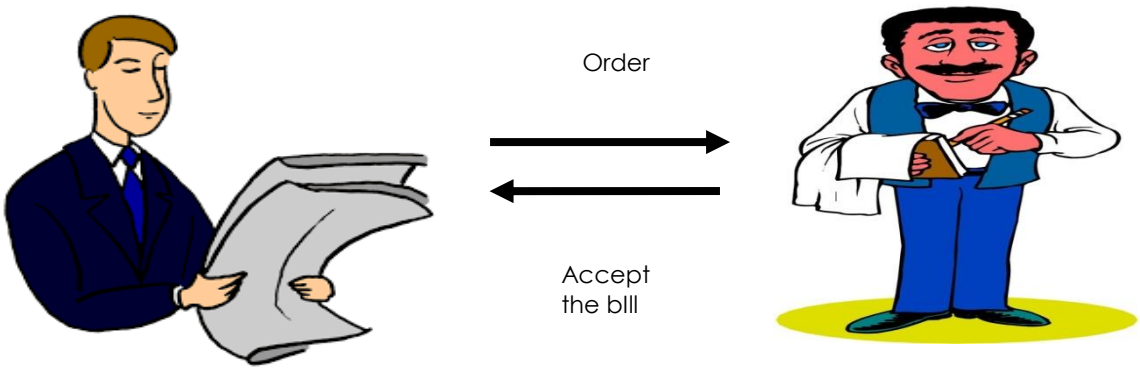
❖ Specimen of Bills of Exchange:

Stamp	Address of Drawer
	Date
Three months after date pay to a sum of ₹50,000 (Fifty Thousands Only) for the value received.	
To B accepted	
(B's Signature and Stamp)	A
	(Drawer)

❖ Types of Bill



❖ **Drawer and Drawee**



Drawer **Drawee**

Drawer

↓

writes out the order to pay

↓

Bills Receivable

↓

"Asset" on acceptance by Drawee

↓

Current Assets

Drawee

↓

Who is accepting the order to pay

↓

Bills Payable

↓

"Liability" on acceptance to pay as per the order

↓

Current Liabilities

❖ HOW TO DETERMINE THE DATE OF MATURITY:

Rules for the determination of the Date of Maturity

R1- If a negotiable instrument has been made payable after a stated number of months **"after date" or "after sight" or "after a certain event",** the period stated shall be held to terminate on the day of the month which corresponds with the day on which the instrument is dated, or presented for acceptance or sight or the event happens. The word 'month' always implies an English calendar month.

Examples:

Bill Date	30.04.2014
Bill Period	3 months
	30.07.2014
Date of Grace	3 days
Date of Maturity	02.08.2014

R2 - If the maturity day of a negotiable instrument comes out to be a **public holiday,** the instrument shall be deemed to be due on the next preceding business day. In case the date of maturity is an emergency holiday, the instrument shall fall due for payment on the next succeeding business day.

Examples:

(i) A bill of exchange dated 23rd December is payable one month after date. The instrument shall fall due for payment on 25th January (26 January being a public holiday).

(ii) A bill of exchange falls due for payment on 25th January. The Government declares the day as a holiday on account of the death of an important leader. The instrument shall fall due for payment on 24th January.

SOME IMPORTANT TERMS

The parties involved in transaction that uses bill of exchange as a mode of settlement are:

Drawer	He is a person who draws the bill. Typically, he is the seller or a creditor.
Drawee	He is the person on whom the bill is drawn. Normally, he is the buyer or debtor. He has to pay the amount of the bill to the drawer on the due date.
Payee	He is the person to whom the amount of bill is payable. He may be the drawer himself or the creditor of the drawer.
Holder	The person who is entitled to the possession of the Bill, Promissory Note or Cheque, in his own name and who has a right to receive or recover the amount due on the instrument is called the 'Holder.' A person who obtains the possession of the instrument by illegal means is not a Holder. For example, a person who has stolen a cheque cannot be its holder.
Holder in due course	The person who obtains a negotiable instrument: (i) for valuable consideration, (ii) in good faith, and,

	(iii) Before maturity. A holder in due course will have a valid title over the instrument (i.e., he can get its payment) though the title of the transferor may be defective. For example, if A gets a cheque for ₹10,000 signed by B, by threatening him, and later on endorses it to C, C will be a holder in due course if he accepts the cheque in good faith (i.e., without knowing that force was used by A), for consideration (i.e., by GIVING something in return for the cheque). In case of a Bill of Exchange, he must also get the Instrument before the date of maturity. A cheque is payable on demand and hence the condition of maturity is not applicable.
Endorsement	The payee of a negotiable instrument may not himself keep the instrument with him. He may transfer the ownership of the instrument in favour of another person. Such a person can get the payment of the instrument from the drawee. The process of transferring of ownership of the instrument is termed as "endorsement" of the instrument.
Maturity of Bill	The term maturity refers the date on which a bill of exchange or a promissory note becomes due for payment. If the instrument is payable on demand, it becomes due immediately on presentation for payment. If it is payable after the expiry of a particular period of time, the date of maturity will be calculated after three days of grace.
Dishonour	Non-payment of the amount of a Promissory Note, Cheque or Bill of Exchange on the date of maturity is called dishonour of the instrument. In the case of a Bill of Exchange, it will also said to be dishonoured if the drawee refuses to accept the Bill.
Noting	Noting is the authentic and official proof of presentment and dishonour of a negotiable instrument. It is a memorandum of a minute recorded by a notary public upon the dishonoured instrument or upon a paper attached thereto or partly upon each. Its need arises in the case of the dishonour of a Bill of Exchange or a Promissory Note. However, noting is not compulsory. It specifies the date of dishonour and reasons, if any, assigned for dishonour and the noting charges. It should be made within a reasonable time after dishonour.
Renewal of Bill	Sometimes the drawee of a bill is not able to meet the bill on due date. He may request the drawer to draw a new Bill for the amount due. Sometimes he pays a certain amount out and accepts a first bill for the balance for which he has to pay a certain amount of interest which is either paid in cash or is included with the fresh bill. This bill is known as Renewal of Bills. That, the amount of the new bill will be **Face Value of the original** − **Cash Payment** + **Interest for the renewed**
Retirement of Bill	Sometimes the drawee pays the bill before the date of maturity. Under the circumstances, the drawer allows certain amount of rebate or discount which is calculated on certain percentage p.a. basis. The rebate is calculated from the date of payment to the date of maturity.

❖ Accounting Entries:

In the Books of Drawer	In the books of Drawee
(1) If the goods sold on credit: Debtors A/c ……..Dr. To, Sales A/c	**(1) If the goods purchased in credit:** Purchase A/c …… Dr. To, Creditors A/c
(2) For Cash/ cheque received: Cash/ Bank A/c ……Dr. To, Debtors A/c	**(2) For Payment:** Creditors A/c …… Dr. To, Cash/ Bank A/c
(3) For Bills Receivable received: Bills Receivable A/c …… Dr. To, Debtors A/c	**(3) For Bills Payable Accepted:** Creditors A/c…….. Dr. To, Bills Payable A/c
(4) Bills Receivable endorsed to creditors: Creditors A/c …… Dr. To, Bill Receivable A/c	**(4) No entry**
(5) For Bills Receivable Discounted: Bank A/c …… Dr. Discount on Bills A/c…….. Dr. To, Bills Receivable A/c	**(5) No Entry**
(6) For Bills Dishonored: Debtors A/c …….. Dr. To, Creditors A/c To, Bank A/c To, Bill for Collection A/c	**(6) For Bills Dishonoured:** Bills Payable A/c ……. Dr. To, Creditors A/c
(7) If Drawee /customer is insolvent and is able to pay final settlement for consideration:	
Cash/ Bank A/c …….. Dr. Bad debts A/c …….. Dr. To, Debtors A/c	Creditors A/c …… Dr. To, Cash/Bank A/c To, Deficiency A/c
(8) If customer is paying some money as part settlement and is renewing the bill (without Interest):	
(a) Cash / Bank A/c …… Dr Bills Receivable A/c …… Dr To, Debtors A/c	**(a)** Creditors A/c …… Dr. To, Cash / Bank A/c To, Bills payable A/c

(9) Bills Receivable was retired before a month and rebate was allowed	
Cash / Bank A/c ..... Dr Rebate allowed A/c .....Dr To, Bills Receivable A/c	Creditors A/c ..... Dr. To, Cash / Bank A/c To, Rebate Received A/c
(10) (a) Part payment and renewed for new bill	
Cash / Bank A/c ..... Dr. To, Debtors A/c	Creditors A/c ..... Dr. To, Cash / Bank A/c
(b) Interest charged on renewed bill	
Debtors A/c ..... Dr. To, Interest on Bills Receivable A/c	Interest on Bills Payable A/c .....Dr To, Creditors A/c
(c) For Bills Receivable Received	
Bills Receivable A//c ..... Dr. To, Debtors A/c	Creditors A/c ..... Dr To, Bills Payable A/c

Example 1

Give necessary entries as would appear in A's Books:

2014	**May,5**	**A drew three bills on B for ₹ 500, ₹400 and ₹300 payable at 4, 3 and 2 months respectively.**
	May,12	**He endorsed the first bill in favour of his creditor C at ₹475**
	May, 19	**He discounted the second bill with his banker for ₹380**
	May, 26	**He was paid the proceeds of the third bill at a rebate of 5% on the total amount of the bill.**

On due dates the first and second bills were dishonoured but the third one was paid.

Solution:

Date	Particulars	L.F.	Amount (₹)	Amount (₹)
2014 May,5	Bills Receivable A/c..... Dr. To, B A/c		1,200	 1,200

	(being three bills for ₹500,₹400 and ₹300 were received from B)			
May,12	C A/c ..... Dr. Discount A/c ..... Dr. To, Bills Receivable A/c (being the first bill for ₹500 was endorsed in favour of C for ₹475)		475 25	 500
May,19	Bank A/c..... Dr. Discount A/c ..... Dr. To, Bills Receivable A/c (being the second bill for ₹400 was discounted with bank)		380 20	 400
May 26	Bank A/c ..... Dr. Rebate allowed A/c ..... Dr. To, Bills Receivable A/c (being the third bill was retired at a rebate of 5% on the amount of the bill)		285 15	 300
Aug 8	B A/c ..... Dr. To Bank A/c (being the second bill dishonoured on maturity)		400	 400
Sept 8	B A/c ..... Dr. To, C A/c (being the first bill dishonoured on maturity)		500	 500

Note: The third bill has been paid before maturity and the entry for its payment has been passed on May 26.

Example 2:

Sunil owed Anil ₹ 80,000. Anil draws a bill on Sunil for that amount for 3 months on 1st April 2014. Sunil accepts it and returns it to Anil. On 15th April 2014, Anil discounts it with Citi Bank at a discount of 12% p.a. On the due date the bill was dishonoured, the bank paid noting charges of ₹100. Anil settles the bank's claim along with noting charges in cash. Sunil accepted another bill for 3 months for the amount due plus interest of ₹3,000 on 1st July 2014. Before the new bill became due, Sunil retires the bill with a rebate of ₹ 500. Show journal entries in books of Anil.

Solution:

Journal entries in the books of Anil

Date	Particulars	L. F.	Dr. (₹)	Cr. (₹)
2014 April, 1	Bills Receivables A/c Dr. To, Sunil's A/c (Being acceptance by Sunil)		80,000	80,000
2014 April, 15	Bank A/c Dr. Discount A/c Dr. To, Bills Receivables A/c (Being discounting of the bill @ 12% p.a.& discounting		78,000 2,000	80,000
2014 June, 30	Sunil's A/c Dr. To, Bank A/c (Being dishonoured of the bill & noting charges paid by bank)		80,100	80,100
2014 June, 30	Bank A/c Dr. To, Cash A/c (Being cash paid to bank)		80,100	80,100
2014 July, 1	Sunil's A/c Dr. To, Interest A/c (Being interest due from Sunil)		3,000	3,000
2014 July, 1	Bills Receivables A/c Dr. To, Sunil's A/c (Being new acceptance by Sunil for ₹ 80,100 & interest of ₹ 3,000)		83,100	83,100
2014 July, 1	Bank A/c Dr. Rebate A/c Dr. To, Bills Receivables A/c (Being the amount received on retirement of the bill)		82,600 500	83,100

Paper 3: Fundamentals of Laws and Ethics (FLE)

CHILD LABOUR (PROHIBITION & REGULATION) ACT, 1986

ACT Divided in four parts with 26 sections and two articles A&B

- **PART I - PRELIMINARY**

  Consist Section 1 & 2 of Act

- **PART II - PROHIBITION OF EMPLOYEMENT OF**

  Children in Certain Occupations and Processes

  Consist Section 3,4 & 5 of Act

  Two Articles A & B Concern with Section 3

- **PART III – REGULATION OF CONDITIONS OF**

  Work of Children

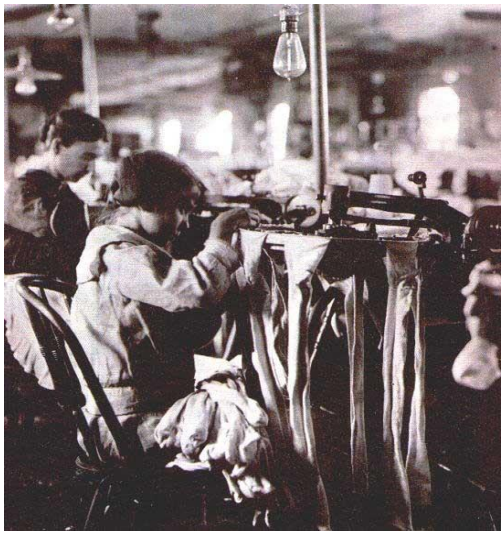
  Consist Section 6 To 13 of Act

- **PART IV – MISCELLANEOUS**

  Consist Section 14 to 26 of Act

Objective:

- **To prohibit the engagement of children in certain employment's**
- **To regulate the conditions of work of children in certain other employment's.**



Section-1

- **Short title, extent and commencement**
  - This Act may be called the Child Labour (Prohibition and Regulation) Act, 1986.
  - It extends to the whole of India.
  - The provisions of this Act, shall come into force at once.

Section-2

- **This section defines the various words and expressions occurring in the Act.**
  - **Child:** means a person who has not completed his 14 year of age.
  - **Establishment:** includes a shop, commercial establishment, work-shop, farm, residential hotel, restaurant, eating-house, theatre or other place of public amusement or entertainment.
  - **Workshop:** any premises wherein any industrial process in carried on.
  - **Occupier:** the person who has the ultimate control over the establishment or workshop.

Section-3

- **This section imposes prohibition on employment of children in the occupation and processes specified in the Schedule, PART A & PART B**

THE SCHEDULE-PART A Occupations

- (1) Transport of passengers, goods or mails by railways;
- (2) Cinder picking, clearing of an ash pit or building operation in the railway premises;
- (3) Work in a catering establishment at a railway station, involving the movement of a vendor or any other employee of the establishment from the one platform to another or in to or out of a moving train;

- (4) Work relating to the construction of a railway station or with any other work where such work is done in close proximity to or between the railway lines;
- (5) A port authority within the limits of any port;
- *(6) Work relating to selling of crackers and fireworks in shops with temporary licenses;
- #(7) Abattoirs/Slaughter House;
- $(8) Automobile workshops and garages;
- (9) Foundries;
- (10) Handling of toxic or inflammable substances or explosives;
- (11) Handloom and power loom industry;
- (12) Mines (underground and under water) and collieries;
- (13) Plastic units and fiberglass workshops;
- +(14) Employment of child as a domestic worker or servant;
- +(15) employment of child in dhabas, restaurants, hotels, motels, tea shops, resorts, spas or other recreational centres

THE SCHEDULE-PART B Processes

- (1) Beedi-making.
- (2) Carpet-weaving.
- (3) Cement manufacture, including bagging of cement.
- (4) Cloth printing, dyeing and weaving.
- (5) Manufacture of matches, explosives and fire-works.
- (6) Mica-cutting and splitting.
- (7) Shellac manufacture.
- (8) Soap manufacture.
- (9) Tanning.
- (10) Wool-cleaning.
- (11) Building and construction industry.

- *(12) Manufacture of slate pencils (including packing).
- *(13) Manufacture of products from agate.
- *(14) Manufacturing processes using toxic metals and substances such as lead, mercury, manganese, chromium, cadmium, benzene, pesticides and asbestos.
- #(15) "Hazardous processes" as defined in Sec. 2 (cb) and dangerous operation' as notice in rules made under section 87 of the Factories Act,1948 (63 of 1948)
- #(16) Printing as defined in Sec.2(k)(iv) of the Factories Act,1948 (63 of 1948)
- #(17) Cashew and cashewnut descaling and processing.
- #(18) Soldering processes in electronic industries.
- $(19) 'Aggarbatti' manufacturing.
- (20) Automobile repairs and maintenance including processes incidental thereto namely, welding, lathe work, dent beating and painting.
- (21) Brick kilns and Roof tiles units.
- (22) Cotton ginning and processing and production of hosiery goods.
- (23) Detergent manufacturing.
- (24) Fabrication workshops (ferrous and non ferrous)
- (25) Gem cutting and polishing.
- (26) Handling of chromite and manganese ores.
- (27) Jute textile manufacture and coir making.
- (28) Lime Kilns and Manufacture of Lime.
- (29) Lock Making.
- (30) Manufacturing processes having exposure to lead such as primary and secondary smelting, welding and cutting of lead-painted metal constructions, welding of galvanized or zinc silicate, polyvinyl chloride, mixing (by hand) of crystal glass mass, sanding or scraping of lead paint, burning of lead in enamelling workshops, lead mining, plumbing, cable making, wiring patenting, lead casting, type founding in printing shops. Store type setting, assembling of cars, shot making and lead glass blowing.
- (31) Manufacture of cement pipes, cement products and other related work.
- (32) Manufacture of glass, glass ware including bangles, florescent tubes, bulbs and other similar glass products.
- (33) Manufacture of dyes and dye stuff.
- (34) Manufacturing or handling of pesticides and insecticides.

- (35) Manufacturing or processing and handling of corrosive and toxic substances, metal cleaning and photo engraving and soldering processes in electronic industry.
- (36) Manufacturing of burning coal and coal briquettes.
- (37) Manufacturing of sports goods involving exposure to synthetic materials, chemicals and leather.
- (38) Moulding and processing of fiberglass and plastic.
- (39) Oil expelling and refinery.
- (40) Paper making.
- (41) Potteries and ceramic industry.
- (42) Polishing, moulding, cutting, welding and manufacturing of brass goods in all forms.
- (43) Processes in agriculture where tractors, threshing and harvesting machines are used and chaff cutting.
- (44) Saw mill – all processes.
- (45) Sericulture processing.
- (46) Skinning, dyeing and processes for manufacturing of leather and leather products.
- (47) Stone breaking and stone crushing.
- (48) Tobacco processing including manufacturing of tobacco, tobacco paste and handling of tobacco in any form.
- (49) Tyre making, repairing, re-treading and graphite benefication.
- (50) Utensils making, polishing and metal buffing.
- (51) 'Zari' making (all processes)'.
- @ (52) Electroplating;
- (53) Graphite powdering and incidental processing;
- (54) Grinding or glazing of metals;
- (55) Diamond cutting and polishing;
- (56) Extraction of slate from mines;
- (57) Rag picking and scavenging.

a. for item (2), the following item shall be substituted,

namely:- '(2) carpet weaving including preparatory and incidental process thereof";

b. for item(4), the following item shall be substituted,

namely:- "(4) cloth printing, dyeing and weaving including processes preparatory and incidental thereto:

c. for item (11) the following shall be substituted,

namely:- "(11) Building and Construction Industry including processing and polishing of granite stones".

* Ins. by Notification No. S. O. 404(E) dated the 5th June1989 published in the Gazette of India , Extraordinary.

Ins. by Notification No. S. O. 263 (E) dated 29th March,1994 published in the Gazette of India, Extraordinary.

$ Ins. Sr. No. 8-13 in Part A and Sr. No. 19-51 in Part B by Notification No. S. O. 36 (E) dated 27th January 1999 published in the Gazette of India, Extraordinary.

@ Ins. Sr. No. 52 – 57 part B by Notification No. S.O. 397 (E) dated the 10th May 2001 published in the Gazette of India, Extraordinary.

+ Ins. Amendment 10 oct 2006 Part II- section 3- sub section ii, Gazette of India , Extraordinary.

Section-4

- **Power to amend the Schedule**
  - The Central Government, after giving by notification in the official Gazette, not less than three months' notice of its intention so to do, may, by like notification, add any occupation or process to the Schedule and thereupon the Schedule shall be deemed to have been amended accordingly.

Section-5

- **This section empowers the Central Government to constitute the Child Labour Technical Advisory Committee for giving advice**
  - The Committee shall consist of a Chairman and such other members not exceeding ten, as may be appointed by the Central Government.
  - The Committee shall have power to regulate its own procedure.
  - The Committee may, if it deems it necessary so to do, constitute one or more sub-committees and may appoint to any such sub-committee, whether generally or for the consideration of any particular matter.

Section-6

- **Application of Part on regulation of Conditions of Work of Children**
  - The provisions of this Part shall apply to an establishment or a class of establishments in which none of the occupations or processes referred to in Sec. 3 is carried on.

Section-7

- **Hours and Period of Work for Children**

  - No child shall be required or permitted to work in excess hours.
  - The period of work on each day so fixed that no period shall exceed three hours and that no child shall work for more than three hours before he has had an interval for rest for at least one hour.
  - The period of work of a child shall not be spread over more than six hours, including interval time & the time spent in waiting for work.
  - No child shall be permitted to work between 7 p.m. and 8 a.m.
  - No child shall be permitted or required to work overtime.
  - No child shall be permitted to work in any establishment on any day on which he has already been working in another establishment.

Section-8

- **Weekly holidays**

Every child employed in an establishment shall be allowed in each week, a holiday or one whole day, which day shall be specified by the occupier in a notice permanently exhibited in a conspicuous place in the establishment.

Section-9:

- **Notice to Inspector**
  - (1) Every occupier in relation to an establishment in which a child was employed, within a period of thirty days, send to the Inspector a written notice containing the following particulars, namely :

(a) the name and situation of the establishment;

(b) the name of occupier;

(c) the address of establishment;

(d) the nature of the occupation or process.

- Nothing in Secs. 7,8and 9 shall apply to any establishment wherein any process is carried on by the occupier with the aid of his family or to any schools established by, or receiving assistance or recognition from, Government.

Section-14:

- **Penalties**

  - (1) Whoever employs any child or permits any child to work in contravention of the provisions of Sec. 3 shall be punishable with imprisonment for a term which shall not be less than three months but which may extend to one year or with fine which shall not be less than ten thousand rupees but which may extend to twenty thousand rupees or with both.
  - (2) Whoever, having been convicted of an offence under Sec.3, commits a like offence afterwards, he shall be punishable with imprisonment for a term which shall not be less than six months but which may extend to two years.
  - (3) Whoever – any person:-

    (a) fails to give notice as required by Sec. 9, or

    (b) fails to maintain a register as required by Sec.11 or false entry or

    (c) fails to display a notice or

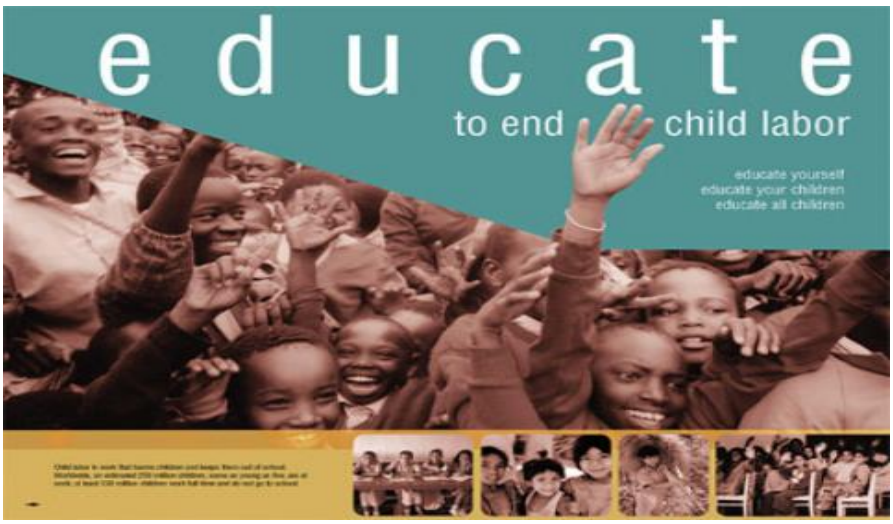
    (d) fails to comply with or contravenes any other provisions of this Act- shall be punishable with simple imprisonment which may extend to one month or with fine which may extend to ten thousand rupees or with both

Some good practical example set by India

- The government of India has been implementing a successful programme- THE NATIONAL CHILD LABOUR PROJECT (NCLP) since 1988 where in 7328 special schools were opened for the children withdrawn from work & providing them education, nutrition, vocational training, stipend & health care etc.
- India was the first country to join the "INTERNATIONAL PROGRAMME ON THE ELIMINATION OF CHILD LABOUR" IN 1992. This is a global programme launched by international labour organization (ILO) in 1991

GLOBAL ACTION PLAN TO ELIMINATING THE WORST FORMS OF CHILD LABOUR BY 2016

No one is born as a Labour in the real sense of the world. It is the society and the evils of the systems that shape the children into labourers…



Thank you for your attention!

Paper 4: Fundamentals of Business Mathematics and Statistics (FBMS)

Limits

Approaching...

Sometimes we can't work something out directly ... but we **can** see what it should be as we get closer and closer!

Example 1:

$$(x^2 - 1)(x - 1)$$

Let's work it out for x=1:

$$\frac{(1^2 - 1)}{(1 - 1)} = \frac{(1 - 1)}{(1 - 1)} = \frac{0}{0}$$

Now 0/0 is a difficulty! We don't really know the value of 0/0 (it is "indeterminate"), so we need another way of answering this.

So instead of trying to work it out for x=1 let's try **approaching** it closer and closer:

Example Continued:

x		$\frac{(x^2 - 1)}{(x - 1)}$
0.5		1.50000
0.9		1.90000
0.99		1.99000
0.999		1.99900
0.9999		1.99990
0.99999		1.99999
...		...

Now we see that as x gets close to 1, then $\frac{(x^2 - 1)}{(x - 1)}$ gets **close to 2**

We are now faced with an interesting situation:

- When x=1 we don't know the answer (it is **indeterminate**)
- But we can see that it is **going to be 2**

We want to give the answer "2" but can't, so instead mathematicians say exactly what is going on by using the special word "limit"

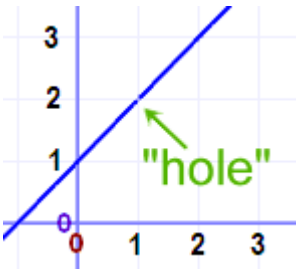
The **limit** of $\frac{(x^2 - 1)}{(x - 1)}$ as x approaches 1 is **2**

And it is written in symbols as:

$$\lim_{x \to 1} \frac{x^2 - 1}{x - 1} = 2$$

So it is a special way of saying, "ignoring what happens when we get there, but as we get closer and closer the answer gets closer and closer to 2"

As a graph it looks like this:



So, in truth, we **cannot say what the value at x=1 is.**

But we **can** say that as we approach 1, **the limit is 2.**

Test Both Sides!

It is like running up a hill and then finding the path **is magically "not there"...**

... but if we only check one side, who knows what happens?

So we need to test it **from both directions** to be sure where it "should be"!

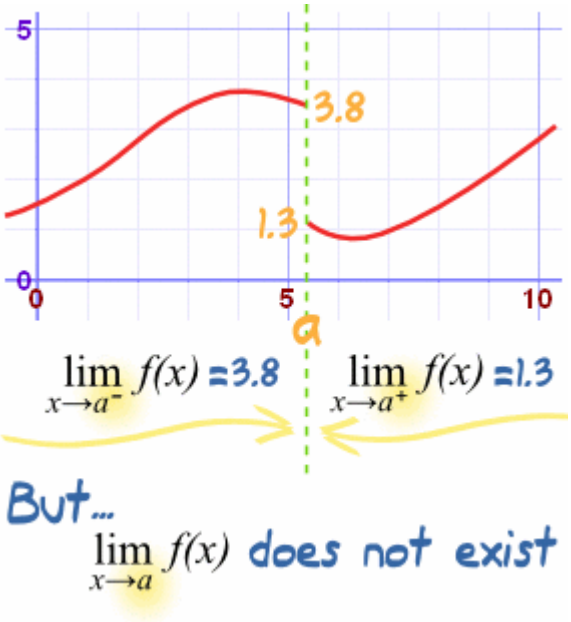
Example Continued

So, let's try from the other side:

x	$(x^2 - 1)(x - 1)$
1.5	2.50000
1.1	2.10000

1.01	2.01000
1.001	2.00100
1.0001	2.00010
1.00001	2.00001
...	...

Also heading for 2, so that's OK



When it is different from different sides

How about a function **f(x)** with a "break" in it like this:

The limit does not exist at "a"

We can't say what the value at "a" is, because there are two competing answers:

- 3.8 from the left, and
- 1.3 from the right

But we **can** use the special "−" or "+" signs (as shown) to define one sided limits:

- the **left-hand** limit (−) is 3.8
- the **right-hand** limit (+) is 1.3

And the ordinary limit **"does not exist"**

Are limits only for difficult functions?

Limits can be used even when we **know the value when we get there**! Nobody said they are only for difficult functions.

Example 2:

$$\lim_{x \to 10} \frac{x}{2} = 5$$

We know perfectly well that 10/2 = 5, but limits can still be used (if we want!)

Limits to Infinity

Infinity is a very special idea. We know we can't reach it, but we can still try to work out the value of functions that have infinity in them.

One Divided By Infinity

Let's start with an interesting example.

Question: What is the value of $\frac{1}{\infty}$?

Answer: We don't know!

Why don't We know?

The simplest reason is that Infinity is not a number, it is an idea.

So $\frac{1}{\infty}$ is a bit like saying $\frac{1}{\text{beauty}}$ or $\frac{1}{\text{tall}}$.

Maybe we could say that $\frac{1}{\infty} = 0$, ... but that is a problem too, because if we divide 1 into infinite pieces and they end up 0 each, what happened to the 1?

In fact $\frac{1}{\infty}$ is known to be **undefined**.

But We Can Approach It!

So instead of trying to work it out for infinity (because we can't get a sensible answer), let's try larger and larger values of x:

x	1x
1	1.00000
2	0.50000
4	0.25000
10	0.10000
100	0.01000
1,000	0.00100
10,000	0.00010

Now we can see that as x gets larger, $\frac{1}{x}$ tends towards 0

We are now faced with an interesting situation:

- We can't say what happens when x gets to infinity
- But we can see that $\frac{1}{x}$ is **going towards 0**

We want to give the answer "0 "but can't, so instead mathematicians say exactly what is going on by using the special word "limit"

The **limit** of $\frac{1}{x}$ as x approaches Infinity is **0**

And write it like this:

$$\lim_{x\to\infty}\left(\frac{1}{x}\right)=0$$

In other words:

As x approaches infinity, then $\frac{1}{x}$ approaches 0

When you see "limit", think "approaching"

It is a mathematical way of saying "we are not talking about when x=∞, but we know as x gets bigger, the answer gets closer and closer to **0**".

Summary

So, sometimes Infinity cannot be used directly, but we **can** use a limit.

What happens **at** ∞ is **undefined** ...	1**x** ✗
... but we do know that **1/x approaches 0** as **x approaches infinity**	$\lim_{x\to\infty}\left(\frac{1}{x}\right)=0$ ✓

Limits Approaching Infinity

What is the limit of this function as x approaches infinity?

y = 2x

Obviously as "x" gets larger, so does "2x":

x	y=2x
1	2
2	4

4	8
10	20
100	200
...	...

So as "x" approaches infinity, then "2x" also approaches infinity. We write this:

$$\lim_{x \to \infty} 2x = \infty$$

	But don't be fooled by the "=". We cannot actually **get** to infinity, but in "limit" language the **limit is infinity** (which is really saying the function is limitless).

Infinity and Degree

We have seen two examples, one went to 0, the other went to infinity.
In fact many infinite limits are actually quite easy to work out, when we figure out "which way it is going", like this

	Functions like **1/x** approach **0** as x approaches infinity. This is also true for $1/x^2$ etc
	A function such as **x** will approach infinity, as well as **2x**, or **x/9** and so on. Likewise functions with x^2 or x^3 etc will also approach infinity.
	But be careful, a function like "**−x**" will approach "**−infinity**", so we have to look at the signs of **x**.

Example 3: $2x^2-5x$

- $2x^2$ will head towards +infinity
- $-5x$ will head towards -infinity
- But x^2 grows more rapidly than **x**, so $2x^2-5x$ will head towards +infinity

In fact, when we look at the Degree of the function (the highest exponent in the function) we can tell what is going to happen:

When the Degree of the function is:

- greater than 0, the limit is **infinity** (or **−infinity**)
- less than 0, the limit is **0**

But if the **Degree is 0 or unknown** then we need to work a bit harder to find a limit.

Rational Functions

A Rational Function is one that is the ratio of two polynomials:

$$f(x) = \frac{P(x)}{Q(x)}$$

For example, here **P(x) = x^3 + 2x − 1**, and **Q(x) = $6x^2$**:

$$\frac{x^3 + 2x - 1}{6x^2}$$

Following on from our idea of the Degree of the Equation, the first step to find the limit is to ...

Compare the **Degree of P(x)** to the **Degree of Q(x)**:

If the Degree of P is less than the Degree of Q...

... the limit is 0.

If the Degree of P and Q are **the same**...

... divide the coefficients of the terms with the largest exponent.

(note that the largest exponents will be equal, as the degree is equal)

If the Degree of P is greater than the Degree of Q...

... then the limit is positive infinity ...

... or maybe negative infinity. **We need to look at the signs!**

We can work out the sign (positive or negative) by looking at the signs of the terms with the largest exponent, just like how we found the coefficients above:

$$\frac{x^3 + 2x - 1}{6x^2}$$

For example this will go to positive infinity, because both ...

- x^3 (the term with the largest exponent in the top) and
- $6x^2$ (the term with the largest exponent in the bottom)

... are positive.

$$\frac{-2x^2 + x}{5x - 3}$$

But this will head for negative infinity, because −2/5 is negative.

A Harder Example: Working Out "e"

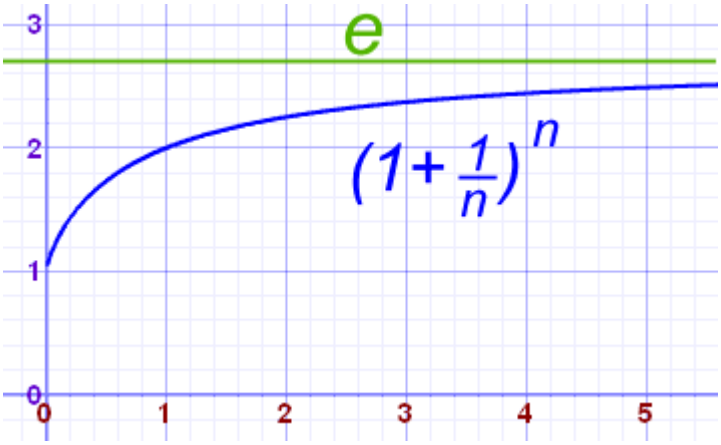
There is a formula for the value of **e (Euler's number)** based on infinity and this formula:

$$(1+ 1/n)^n$$

At Infinity: $(1+1/\infty)^\infty$ = ??? ... we don't know!

So instead of trying to work it out for infinity (because we can't get a sensible answer), let's try larger and larger values of n:

n	$(1 + 1/n)^n$
1	2.00000
2	2.25000
5	2.48832
10	2.59374
100	2.70481
1,000	2.71692
10,000	2.71815
100,000	2.71827



It is heading towards the value **2.71828...** which is the magic number **e (Euler's Number)**.

So again we have an odd situation:

- We don't know what the value is when n=infinity
- But we can see that it settles towards 2.71828...

So we use limits to write the answer like this:

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$$

It is a mathematical way of saying "we are not talking about when n=∞, but we know as n gets bigger, the answer gets closer and closer to the value of **e**".

Don't Do It The Wrong Way ... !

We can see by the graph and the table that as **n** get larger the function approaches **2.71828....**

But trying to use infinity as a "very large real number" (**it isn't!**) would give this:

$(1+1/\infty)^\infty = (1+0)^\infty = (1)^\infty = 1$ ✗

So, don't try to use Infinity as a real number, you will get **wrong answers**!

Limits are the right way to go.

Limits (Evaluating)

Evaluating Limits

"Evaluating" means to find the value of (think e-"**value**"-ating)

In the Example 1 above we said the limit was 2 because it **looked like it was going to be**. But that is not really good enough!

In fact there are **many ways** to get an accurate answer. Let's look at some:

1. Just Put The Value In

The first things to try are just putting the value of the limit in, and see if it works (in other words substitution).

Let's try some examples:

Example	Substitute Value	Works?
$\lim_{x\to 1}\frac{x^2-1}{x-1}$	(1−1)/(1−1) = 0/0	✗
$\lim_{x\to 10}\frac{x}{2}$	10/2 = **5**	✓

It didn't work with the first one (we knew that!), but the second example gave us a quick and easy answer.

2. Factors

We can try factoring.

Example 4: $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$

By factoring (x^2-1) into $(x-1)(x+1)$ we get:

$$\lim_{x \to 1} \frac{x^2 - 1}{x - 1} = \lim_{x \to 1} \frac{(x - 1)(x + 1)}{x - 1} = \lim_{x \to 1} (x + 1)$$

Now we can just substitiute x=1 to get the limit:

$$\lim_{x \to 1} (x + 1) = 1 + 1 = 2$$

3. Conjugate

When it's a fraction, multiplying top and bottom by a conjugate might help.

The conjugate is where we change the sign in the middle of 2 terms like this:

Here is an example where it will help us find a limit:

$\lim_{x \to 4} \frac{2 - \sqrt{x}}{4 - x}$ Evaluating this at x=4 gives 0/0, which is not a good answer!

So, let's try some rearranging:

Multiply top and bottom by the conjugate of the top:

$$\frac{2 - \sqrt{x}}{4 - x} \times \frac{2 + \sqrt{x}}{2 + \sqrt{x}}$$

Simplify top using $(a + b)(a - b) = a^2 - b^2$:

$$\frac{2^2 - (\sqrt{x})^2}{(4 - x)(2 + \sqrt{x})}$$

Simplify top further:

$$\frac{(4 - x)}{(4 - x)(2 + \sqrt{x})}$$

Cancel (4−x) from top and bottom: $\frac{1}{2+\sqrt{x}}$

So, now we have:

$$\lim_{x\to 4}\frac{2-\sqrt{x}}{4-x}=\lim_{x\to 4}\frac{1}{2+\sqrt{x}}=\frac{1}{2+\sqrt{4}}=\frac{1}{4}$$

Done!

4. Infinite Limits and Rational Functions

A Rational Function is one that is the ratio of two polynomials: $f(x)=\frac{P(x)}{Q(x)}$

For example, here **P(x) = x^3 + 2x − 1**, and **Q(x) = 6x^2**: $\frac{x^3+2x-1}{6x^2}$

By finding the overall Degree of the Function we can find out whether the function's limit is 0, Infinity, -Infinity, or easily calculated from the coefficients.

5. Formal Method

The formal method sets about proving that we can get **as close as we want** to the answer by making "x" close to "a".