

Maths unit-1
 • Elimination of one constant
 Lagrange $Pp + Qq = R$
 $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
 (auxiliary equation)
 find 2 constants
 write $\phi(a, b, c) = 0$
 ratio ②
 $\frac{dx}{P} + \frac{dy}{Q} + \frac{dz}{R} = 0$
 function

Type-2 $z = f(x, y) + g(h, q)$
 (clears)

• replace (a, b)
 $(x, y) = g(h, q)$
 $u = h(a)$
 \rightarrow partially D w.r.t
 to get general
 solution
 • name singular sol
 P.D w.r.t (a, b)
 $0 = x + f'(a, b)$
 $0 = y + f'(a, b)$
 (eliminate (a, b)) to get

III (ii) $f(x, y, z) = 0$

$q = a$
 $p = \phi(x, a)$
 $dz = p dx + q dy$
 $z = \phi(x, a) + ay + c$
 $c \rightarrow h(a)$
 and diff w.r.t a
 to get general sol

III (3) $f(y, p, q)$

$p = a$
 $q = \phi(a, y)$
 $dz = p dx + q dy$
 $z = a x + \phi(a, y) + c$
 $(C.I.)$
 $c \rightarrow h(a)$
 eliminate a to get
 general sol

Type-III

$z = f(x, y, p, q)$
 $z = f(u)$
 $u = x + ay$
 $\frac{dz}{dx} = \frac{dz}{du} \frac{du}{dx}$

$$\frac{dz}{dx} = \frac{dz}{du} \frac{du}{dx} = \frac{dz}{du} \cdot 1 = \frac{dz}{du}$$

$$\frac{dz}{du} = f'(u)$$

$$\frac{dz}{du} = a \quad ; \quad \frac{dz}{dy} = \frac{dz}{du} a \quad \left(q = a \frac{dz}{du} \right)$$

$$\textcircled{1} \quad F(z, p, q) = 0 \quad \left(p = \frac{dz}{du}, q = a \frac{dz}{du} \right)$$

rule p and q

$$\left(\frac{dz}{du} \right) = u + c$$

name put value
 of u to get C.I.
 similarly find C.S

$$6 \text{ in } 100 \rightarrow 100 \div 6 = 16 \text{ remainder } 4$$

$$4 \times 3 + 1 = 13$$

$$13 \times 3 + 1 = 40$$

$$40 \times 3 + 1 = 121$$

$$121 \times 3 + 1 = 364$$

$$364 \times 3 + 1 = 1093$$

$$1093 \times 3 + 1 = 3280$$

$$3280 \times 3 + 1 = 9841$$

$$9841 \times 3 + 1 = 29524$$

$$29524 \times 3 + 1 = 88573$$

$$88573 \times 3 + 1 = 265720$$

$$265720 \times 3 + 1 = 797161$$

$$797161 \times 3 + 1 = 2391484$$

$$2391484 \times 3 + 1 = 7174453$$

$$7174453 \times 3 + 1 = 21523360$$

$$21523360 \times 3 + 1 = 64570081$$

$$64570081 \times 3 + 1 = 193710244$$

$$193710244 \times 3 + 1 = 581130733$$

$$581130733 \times 3 + 1 = 1743392200$$

$$1743392200 \times 3 + 1 = 5230176601$$

$$5230176601 \times 3 + 1 = 15690529804$$

$$15690529804 \times 3 + 1 = 47071589413$$

$$47071589413 \times 3 + 1 = 141214768240$$

$$141214768240 \times 3 + 1 = 423644304721$$

$$423644304721 \times 3 + 1 = 1270932914164$$

$$1270932914164 \times 3 + 1 = 3812808742493$$

$$3812808742493 \times 3 + 1 = 11438426227480$$

$$11438426227480 \times 3 + 1 = 34315278682441$$

$$34315278682441 \times 3 + 1 = 102945836047324$$

$$102945836047324 \times 3 + 1 = 308837508141973$$

$$308837508141973 \times 3 + 1 = 926512524425920$$

$$926512524425920 \times 3 + 1 = 2779537573277761$$

$$2779537573277761 \times 3 + 1 = 8338612719833284$$

$$8338612719833284 \times 3 + 1 = 25015838159499853$$

$$25015838159499853 \times 3 + 1 = 75047514478499560$$

$$75047514478499560 \times 3 + 1 = 225142543435498681$$

$$225142543435498681 \times 3 + 1 = 675427630306496044$$

$$675427630306496044 \times 3 + 1 = 2026282890919488133$$

$$2026282890919488133 \times 3 + 1 = 6078848672758464400$$

$$6078848672758464400 \times 3 + 1 = 18236546018275393201$$

$$18236546018275393201 \times 3 + 1 = 54709638054826179604$$

$$54709638054826179604 \times 3 + 1 = 164128914164478538813$$

$$164128914164478538813 \times 3 + 1 = 492386742493435616440$$

$$492386742493435616440 \times 3 + 1 = 1477160227480306849321$$

$$1477160227480306849321 \times 3 + 1 = 4431480682440920547964$$

$$4431480682440920547964 \times 3 + 1 = 13294442047322761643893$$

$$13294442047322761643893 \times 3 + 1 = 39883326141968284931680$$

$$39883326141968284931680 \times 3 + 1 = 119649978425904854795041$$

$$119649978425904854795041 \times 3 + 1 = 358949935277714564385124$$

$$358949935277714564385124 \times 3 + 1 = 1076849805833143693155373$$

$$1076849805833143693155373 \times 3 + 1 = 3230549417499431079466120$$

$$3230549417499431079466120 \times 3 + 1 = 9691648252498293238398361$$

$$9691648252498293238398361 \times 3 + 1 = 29074944757494879715195084$$

$$29074944757494879715195084 \times 3 + 1 = 87224834272484639145585253$$

$$87224834272484639145585253 \times 3 + 1 = 261674502817453917436755760$$

$$261674502817453917436755760 \times 3 + 1 = 785023508452361752310267281$$

$$785023508452361752310267281 \times 3 + 1 = 2355070525357085256930801844$$

$$2355070525357085256930801844 \times 3 + 1 = 7065211576071255770792405533$$

$$7065211576071255770792405533 \times 3 + 1 = 21195634728213767312377216600$$

$$21195634728213767312377216600 \times 3 + 1 = 63586904184641301937131649801$$

$$63586904184641301937131649801 \times 3 + 1 = 190760712553923905811394949404$$

$$190760712553923905811394949404 \times 3 + 1 = 572282137661771717434184848213$$

$$572282137661771717434184848213 \times 3 + 1 = 1716846412985315152302554544640$$

$$1716846412985315152302554544640 \times 3 + 1 = 5150539238955945456907663633921$$

$$5150539238955945456907663633921 \times 3 + 1 = 15451617716867836370722990901764$$

$$15451617716867836370722990901764 \times 3 + 1 = 46354853150603509112168972705293$$

$$46354853150603509112168972705293 \times 3 + 1 = 139064559451810527336506918115880$$

$$139064559451810527336506918115880 \times 3 + 1 = 417193678355431582009520754347641$$

$$417193678355431582009520754347641 \times 3 + 1 = 1251581035066294746028562263042924$$

$$1251581035066294746028562263042924 \times 3 + 1 = 3754743105198884238085686789128773$$

$$3754743105198884238085686789128773 \times 3 + 1 = 11264229315596652714257060367386320$$

$$11264229315596652714257060367386320 \times 3 + 1 = 33792687946789958142771181102158961$$

$$33792687946789958142771181102158961 \times 3 + 1 = 101378063840369874428313543306476884$$

$$101378063840369874428313543306476884 \times 3 + 1 = 304134191521109823284940629919430653$$

$$304134191521109823284940629919430653 \times 3 + 1 = 912402574563329469854821889758291960$$

$$912402574563329469854821889758291960 \times 3 + 1 = 2737207723689988409564465669274875881$$

$$2737207723689988409564465669274875881 \times 3 + 1 = 8211623171069965228693396907824627644$$

$$8211623171069965228693396907824627644 \times 3 + 1 = 24634869513209895686080190723473882933$$

$$24634869513209895686080190723473882933 \times 3 + 1 = 73904608539629687058240572170421648800$$

$$73904608539629687058240572170421648800 \times 3 + 1 = 221713825618889061174721716511264946401$$

$$221713825618889061174721716511264946401 \times 3 + 1 = 665141476856667183524165149533794839204$$

$$665141476856667183524165149533794839204 \times 3 + 1 = 1995424430570001550572495448601384517613$$

$$1995424430570001550572495448601384517613 \times 3 + 1 = 5986273291710004651717486345804153552840$$

$$5986273291710004651717486345804153552840 \times 3 + 1 = 17958819875130013955152459037412460658521$$

$$17958819875130013955152459037412460658521 \times 3 + 1 = 53876459625390041865457377112237381975564$$

$$53876459625390041865457377112237381975564 \times 3 + 1 = 161629378876170125596372131336712145926693$$

$$161629378876170125596372131336712145926693 \times 3 + 1 = 484888136628510376789116394010136437780080$$

$$484888136628510376789116394010136437780080 \times 3 + 1 = 1454664409885531130367349182030409313340241$$

$$1454664409885531130367349182030409313340241 \times 3 + 1 = 4363993229656593391102047546091227940020764$$

$$4363993229656593391102047546091227940020764 \times 3 + 1 = 13091979688969780173306142638273683820062293$$

$$13091979688969780173306142638273683820062293 \times 3 + 1 = 39275939066909340519918427914821051460186880$$

$$39275939066909340519918427914821051460186880 \times 3 + 1 = 117827817200728021559755283744463154380560641$$

$$117827817200728021559755283744463154380560641 \times 3 + 1 = 353483451602184064679265851233389463141681924$$

$$353483451602184064679265851233389463141681924 \times 3 + 1 = 1060450354806552194037797553700168389425045773$$

$$1060450354806552194037797553700168389425045773 \times 3 + 1 = 3181351064419656582113392661100505168275137320$$

$$3181351064419656582113392661100505168275137320 \times 3 + 1 = 9544053193258969746340177983301515504825411961$$

$$9544053193258969746340177983301515504825411961 \times 3 + 1 = 28632159579776909239020533949904546514476235884$$

$$28632159579776909239020533949904546514476235884 \times 3 + 1 = 85896478739330727717061601849713639543428707653$$

$$85896478739330727717061601849713639543428707653 \times 3 + 1 = 257689436217992183151184805549140918630286122960$$

$$257689436217992183151184805549140918630286122960 \times 3 + 1 = 773068308653976549453554416647422755890858368881$$

$$773068308653976549453554416647422755890858368881 \times 3 + 1 = 2319204925961929648360663250042268267672575106644$$

$$2319204925961929648360663250042268267672575106644 \times 3 + 1 = 6957614777885788945081989750126804803017725319933$$

$$6957614777885788945081989750126804803017725319933 \times 3 + 1 = 20872844333657366835245969250380414409053175959800$$

$$20872844333657366835245969250380414409053175959800 \times 3 + 1 = 62618532999972090505737907751141243227159527879401$$

$$62618532999972090505737907751141243227159527879401 \times 3 + 1 = 187855598999916271517213723253423729681478583638204$$

$$187855598999916271517213723253423729681478583638204 \times 3 + 1 = 563566796999748814551641169760271189044435750914613$$

$$563566796999748814551641169760271189044435750914613 \times 3 + 1 = 1690700390999246443654923509280813567133307252743840$$

$$1690700390999246443654923509280813567133307252743840 \times 3 + 1 = 5072101172997739330964770527842440701400021758231521$$

$$5072101172997739330964770527842440701400021758231521 \times 3 + 1 = 15216303518993217992894311583527322104200065274694564$$

$$15216303518993217992894311583527322104200065274694564 \times 3 + 1 = 45648910556979653978682934750581966312600195824083697$$

$$45648910556979653978682934750581966312600195824083697 \times 3 + 1 = 136946731670938961936048804251745898937800587472251091$$

$$136946731670938961936048804251745898937800587472251091 \times 3 + 1 = 410840195012816885808146412755237696813401762416753274$$

$$410840195012816885808146412755237696813401762416753274 \times 3 + 1 = 1232520585038450657424439238265713090440205287250259821$$

$$1232520585038450657424439238265713090440205287250259821 \times 3 + 1 = 3697561755115351972273317714797139271320615861750779464$$

$$3697561755115351972273317714797139271320615861750779464 \times 3 + 1 = 11092685265346055916819953144391417813961847585252338397$$

$$11092685265346055916819953144391417813961847585252338397 \times 3 + 1 = 33278055796038167750459859433174253441885542755757015194$$

$$33278055796038167750459859433174253441885542755757015194 \times 3 + 1 = 99834167388114503251379578299522760325656628267271045585$$

$$99834167388114503251379578299522760325656628267271045585 \times 3 + 1 = 299502502164343509754138734898568280976969884801813136756$$

$$299502502164343509754138734898568280976969884801813136756 \times 3 + 1 = 898507506493030529262416204695704842930909654405439410269$$

$$898507506493030529262416204695704842930909654405439410269 \times 3 + 1 = 2695522519479091587787248614087114528792728963216318230808$$

$$2695522519479091587787248614087114528792728963216318230808 \times 3 + 1 = 8086567558437274763361745842261343586378186889648954692425$$

$$8086567558437274763361745842261343586378186889648954692425 \times 3 + 1 = 24259702675311824280085237526784030759134560668946864077276$$

$$24259702675311824280085237526784030759134560668946864077276 \times 3 + 1 = 72779108025935472840255712580352092277403682006840592231829$$

$$72779108025935472840255712580352092277403682006840592231829 \times 3 + 1 = 218337324077806418520767137741056276832211046020521776695488$$

$$218337324077806418520767137741056276832211046020521776695488 \times 3 + 1 = 655011972233419255562301413223168830496633138061565330086465$$

$$655011972233419255562301413223168830496633138061565330086465 \times 3 + 1 = 1965035916700257766686904239669506481489899414184695990259396$$

$$1965035916700257766686904239669506481489899414184695990259396 \times 3 + 1 = 5895107750100773300060712719008519444469698242554087970778191$$

$$5895107750100773300060712719008519444469698242554087970778191 \times 3 + 1 = 17685323250302319900182138157025558333409094727662263912334574$$

$$17685323250302319900182138157025558333409094727662263912334574 \times 3 + 1 = 53055969750906959700546414471076674990227284182986791737003723$$

$$53055969750906959700546414471076674990227284182986791737003723 \times 3 + 1 = 159167909252720879101639243413230024970681852548960375211011170$$

$$159167909252720879101639243413230024970681852548960375211011170 \times 3 + 1 = 477503727758162637304917730239690074912045557646881125633033521$$

$$477503727758162637304917730239690074912045557646881125633033521 \times 3 + 1 = 1432511183274487911914753190719070224736136672940643376899100564$$

$$1432511183274487911914753190719070224736136672940643376899100564 \times 3 + 1 = 4297533549823463735744259572157210674208409018821930130697301693$$

$$4297533549823463735744259572157210674208409018821930130697301693 \times 3 + 1 = 12892600649470391207232778716471632022625227056465790392091905079$$

$$12892600649470391207232778716471632022625227056465790392091905079 \times 3 + 1 = 38677801948411173621698336149414896067875681169397371176275715238$$

$$38677801948411173621698336149414896067875681169397371176275715238 \times 3 + 1 = 116033405845233520865095008448244688203627043508192113528827145715$$

$$116033405845233520865095008448244688203627043508192113528827145715 \times 3 + 1 = 348100217535700562595285025344734064610881130524576340586481437146$$

$$348100217535700562595285025344734064610881130524576340586481437146 \times 3 + 1 = 1044300652607101687785855076034202193832643391573729021759444311439$$

$$1044300652607101687785855076034202193832643391573729021759444311439 \times 3 + 1 = 3132901957821305063357565228102606581497930174721187065278332934318$$

$$3132901957821305063357565228102606581497930174721187065278332934318 \times 3 + 1 = 9408705873463915190072695684307819744493790524163561195834998802975$$

$$9408705873463915190072695684307819744493790524163561195834998802975 \times 3 + 1 = 2822611762039174557021808705292345923348137157249$$

Synthetic division

1 zero is known

$$x^4 + x^3 - 11x^2 - 5x + 30 = 0$$

| | | | | | | |
|---|--|---|---|-----|-----|-----|
| 2 | | 1 | 1 | -11 | -5 | 30 |
| | | ↓ | 2 | 6 | -10 | -30 |
| | | 1 | 3 | -5 | -15 | 0 |

$$(x^3 + 3x^2 - 5x - 15) = 0$$

means
2 is a
solution

1 compound I = $P(1 + \frac{R}{100})^n$

$\Rightarrow P(1 + \frac{R}{200})^{2n}$ Hal

2 years

1 compound $I = P\left(1 + \frac{R}{100}\right)^n$

$\Rightarrow P\left(1 + \frac{R}{200}\right)^{2n}$ Half $\rightarrow P\left(1 + \frac{R}{400}\right)^{4n}$ quarterly

2 years

$CI - SI = P\left(\frac{R}{100}\right)^2$

3 years

$CI - SI = P\left(\frac{R^2}{100^2}\right) \times \left(\frac{300+R}{100}\right)$

$\log_a a = 1$

$\log_a 1 = 0$

$(\log_a m)^x = \frac{x \log_a m}{\log_a m}$

$\log_a a \times \log_c a = (\log_c a) \text{ chain}$

$\log_a m = \frac{\log_c m}{\log_c a}$

$\log_a m = \frac{1}{\log_m a}$

$(u) = \text{number of odd numbers}$
 $(b) 346$
 $(2) 3$

$\sum_{n=1}^u (1+u)u = \text{sum of odd numbers}$
 $\sum_{n=1}^u (1+u)u = \text{sum of even numbers}$
 $\sum_{n=1}^u (1+u)u = \sum_{n=1}^u u^2$
 $\sum_{n=1}^u (1+u)u = \sum_{n=1}^u u^2$

sum of all factors
 $= \left(\frac{a^{p+1}-1}{a-1} \right) \times \left(\frac{b^{q+1}-1}{b-1} \right) \times \dots$

$a \times b = \text{LCM} \times \text{HCF}$
 $\text{LCM} = \frac{\text{LCM num}}{\text{HCF den}}$

HCF of a = $\frac{\text{HCF num}}{\text{LCM den}}$

| | | | |
|---------|----|-----|----|
| 1 | 2 | 3 | 4 |
| 2 → 2 | 4 | 8 | 6 |
| 3 → 3 | 9 | 7 | 1 |
| 4 → 4 | 12 | 16 | 4 |
| 5 → 5 | 20 | 25 | 5 |
| 6 → 6 | 30 | 36 | 6 |
| 7 → 7 | 42 | 49 | 7 |
| 8 → 8 | 48 | 64 | 8 |
| 9 → 9 | 54 | 81 | 9 |
| 10 → 10 | 60 | 100 | 10 |

Highest number of
 2 in 100
 $100/2 = 50 + 25 + 12 + 6$
 $43 + 1 = 47$
 6 in 100
 $= \text{smaller of } (2, 3)$
 $= \text{smaller of } (97, 48)$
 $= 48$

from
 throw
 $\sum r = \sum (r \times r)$
 $R = R_1 \times R_2$

successive division
 eg. num die su ley
 3, 5, 6 leaves 1, 3, 2
 find g form
 $3 \times 5 \times 6$
 30×6
 180

LCM
 ① LCM of R
 ② LCM of K
 $\text{LCM} = \frac{\text{LCM num}}{\text{HCF den}}$

Fermat's theorem
 $a^{p-1} \equiv 1 \pmod{p}$

$(a+b)^n$
 $(a-b)^n$
 $(a+b)^n$
 $(a-b)^n$