

## ALGEBRA Inequalities & Quadratic Equations



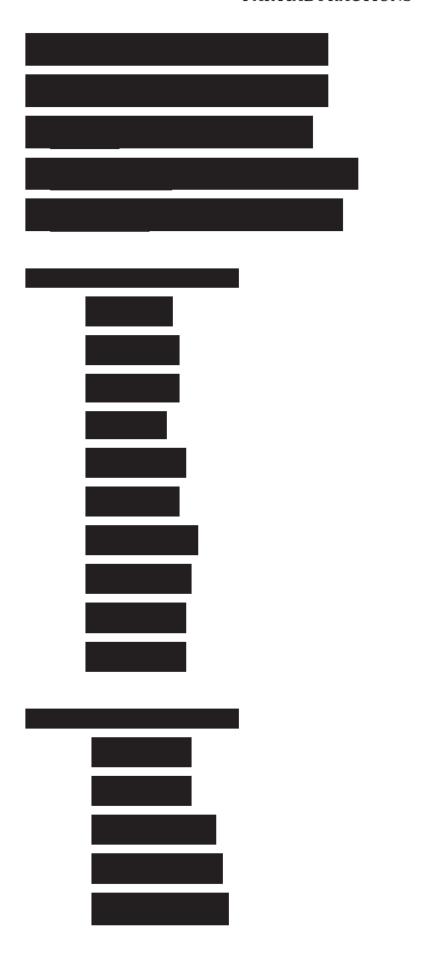
RAJ WIJESINGHE

Did you hear about the rose that grew from a crack in the concrete? Proving nature's law is wrong it learned to walk without having feet.

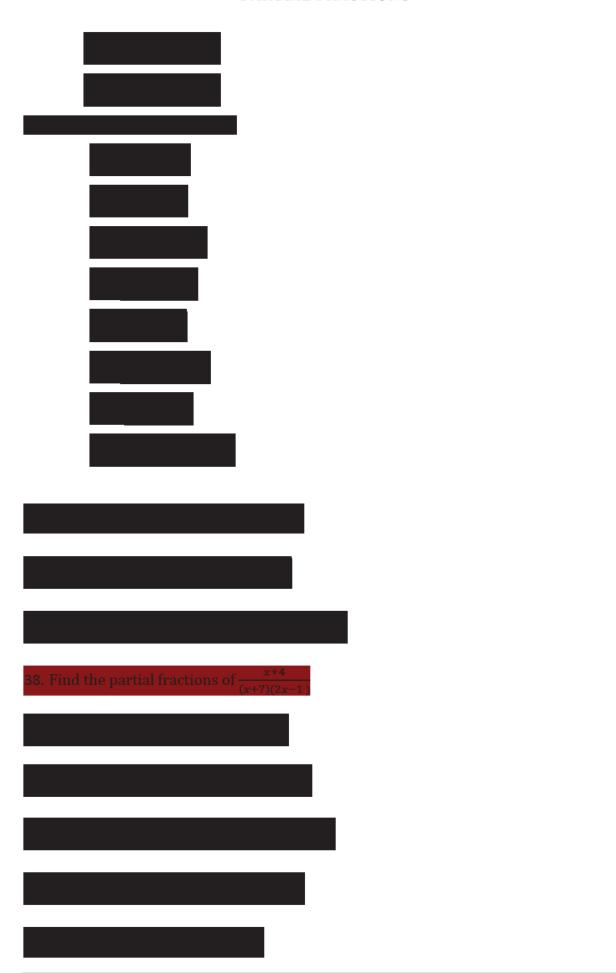
Funny it seems, but by keeping its dreams, it learned to breathe fresh air.

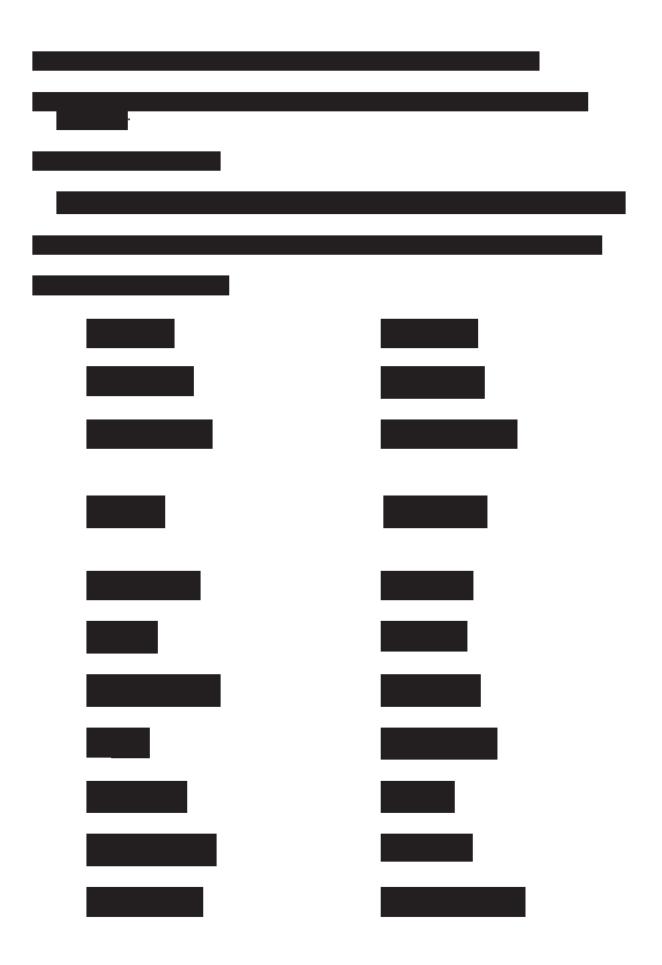
Long live the rose that grew from concrete when no one else ever cared.

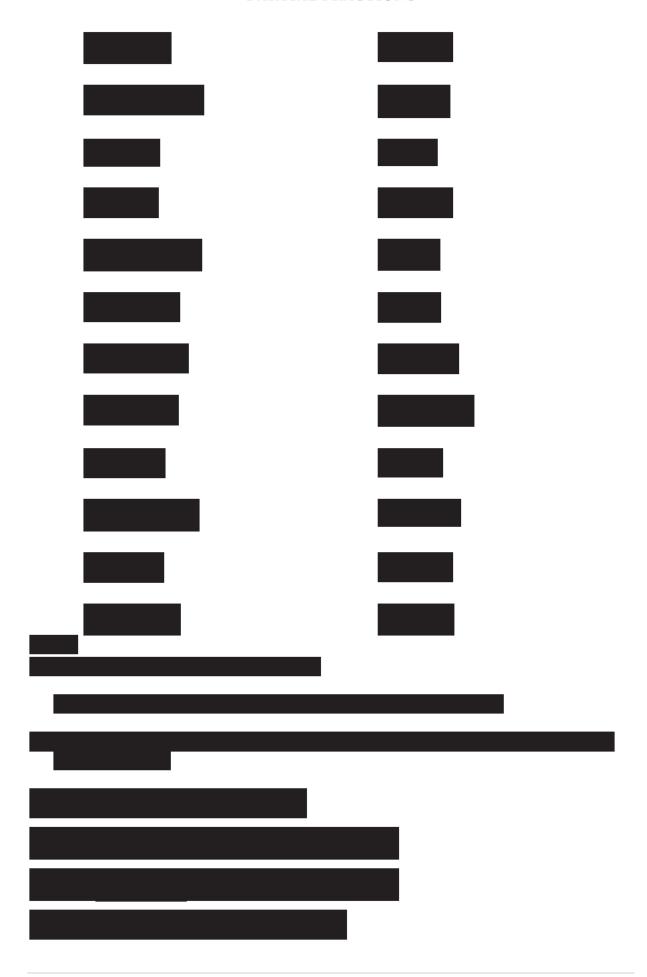
5.
6. $\frac{4x^2+3x-1}{(3x-1)(x-2)(4x-1)}$ convert to partial fractions.
(3x-1)(x-2)(4x-1) convert to partial fractions.

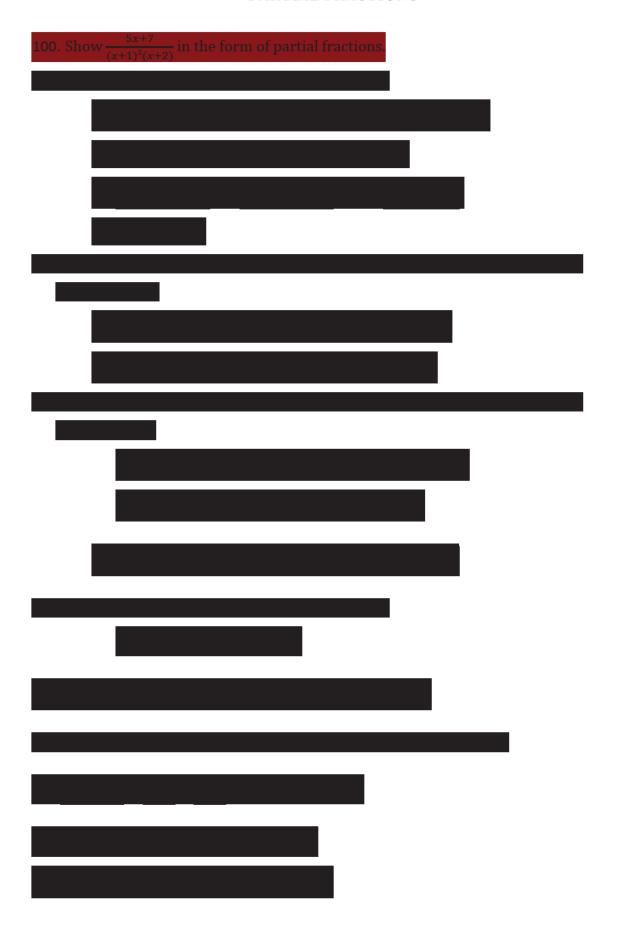






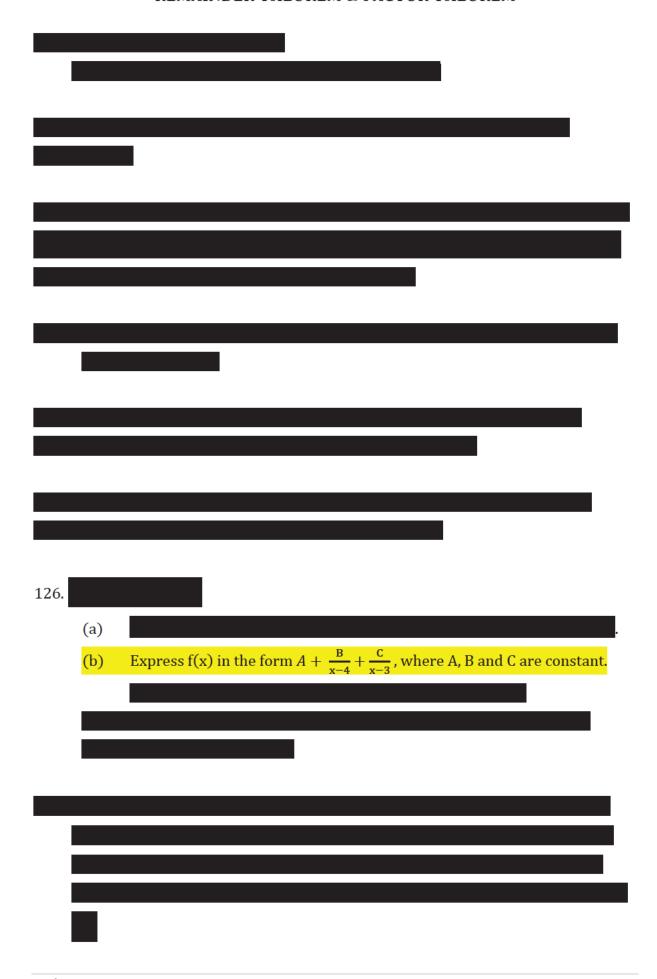










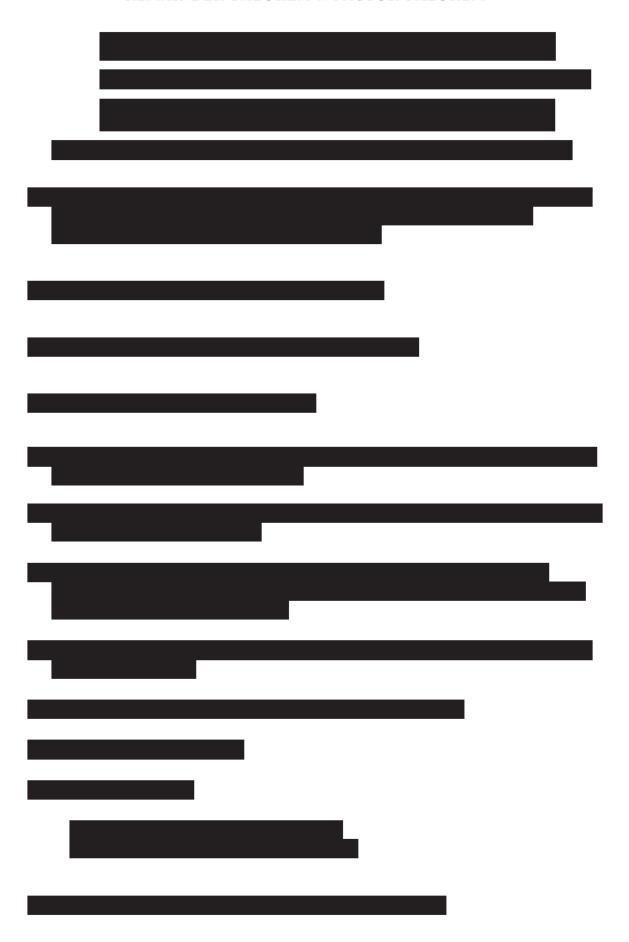






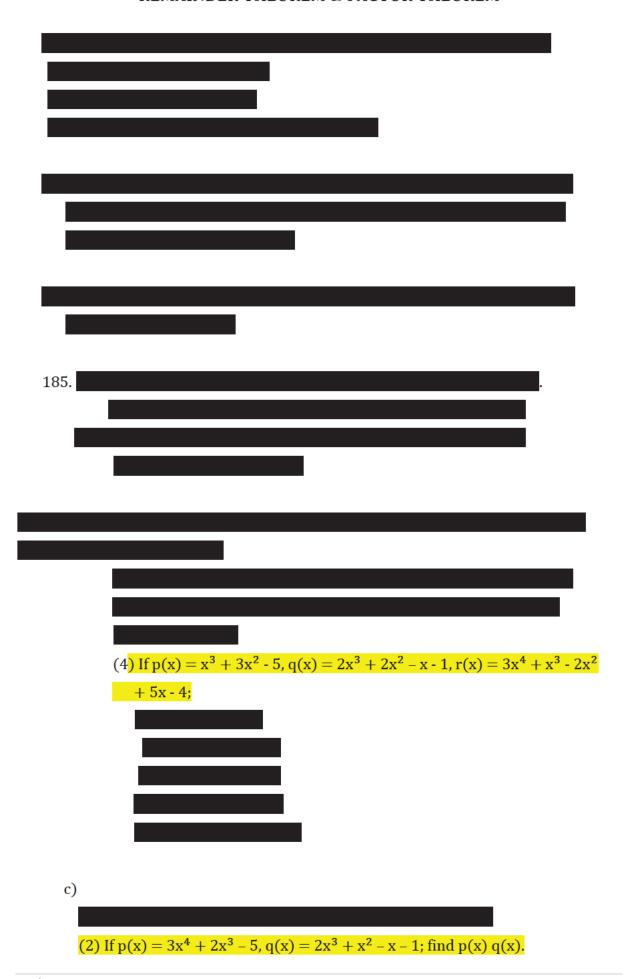


147.	(a)	$f(x) = px^4 + qx^3 + rx^2 + sx + t$ .
148.	(a)	$f(x) = x^4 - bx^3 - 11x^2 + 4(b+1)x + a.$











187. 1. 
$$x^2 - x - 4 \div (x - 1)$$
 2.  $x^3 + x - 1 \div (x + 1)$ 

2. 
$$x^3 + x - 1 \div (x + 1)$$

3. 
$$x^3 - x^2 + x - 1 \div (x - 2)$$
 4.  $2x^2 - x - 1 \div (x - 3)$ 

4 
$$2x^2 - x - 1 \div (x - 3)$$

5. 
$$x^4 + 2x^3 + x^2 \div x - 2 \div (x - 1)$$
 6.  $2x^4 + 3x - 1 \div (2x - 1)$ 

$$6.2v^4 \pm 3v - 1 \pm (2v - 1)$$

7. 
$$x^3 - 2x^2 - x + 5 \div (3x + 1)$$

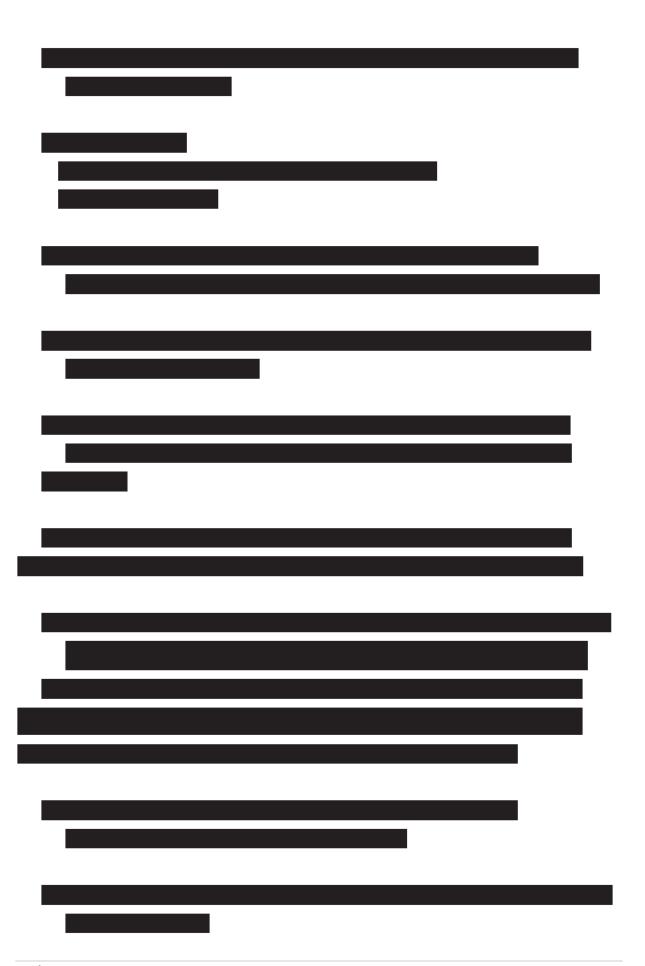
7. 
$$x^3 - 2x^2 - x + 5 \div (3x + 1)$$
 8.  $2x^4 - 7x^3 + 12x^2 - 2x - 5 \div (2x + 1)$ 



$f(a) - f(b) \qquad (af(b) - bf(a))$
$\frac{f(a) - f(b)}{(a - b)} x + \frac{(af(b) - bf(a))}{(a - b)}$
195. (1) Find m and n as the remainder is $5x - 2$ when the polynomial
$f(x) \equiv x^4 - mx^2 + n$ is divided by $(x + 1)^2$ .
(2) If $(x^2 + 1)$ is a factor of the polynomial $f(x) \equiv x^4 + px^3 + 3x + q$ , find p
and q. For the values obtained for p and q, find real roots of the equation
$x^4 + px^3 + x^2 + 3x + q + 1 = 0.$
A + pA + A + SA + Q + I = 0



(2) $x^3 - 7x - 6$
209. Express the polynomial $x^3 - 3x^2 + 10x - 5$ in the form $Ax(x - 1)(x + 2) + Bx(x - 1)$
1) + $(x + 1)$ . Here, A, B, C and D are constants that are needed to be found.
214. (1) The polynomial $x^8 + 2x^7 + ax^2 + bx + c$ is divided completely by $x^2 + x$
-2, and the remainder is -8 when the polynomial is divided by $(x + 1)$ .
Find a, b and c.
en e



231. If $x^3 + ax^2 + b$ and $ax^3 + bx^2 + x$ - a have a common factor, show that it is a factor of $(b - a^2) x^2 + x$ - a $(1 + b)$ too.
234. Equation $3x^4 + 2x^3 - 6x^2 - 6x + p = 0$ have two common roots. Find the value
of p.



247. (i) If the remainders are equal when the function  $f(x) \equiv 2x^2 + px^2 - qx + r$  is divided by x-1 and x – 2, show that 3p - q + 21 = 0. 250. (ii) Divide the function  $P(x) = 2x^3 + 4x^2 + 3x + 3$  by x + 2.

252.	$x^8 + 2x^7 - 3x^3 + px + q$	
	is a non-zero integer and $f(x) = 2x^3 + 3x^2 - 3x + a$ . Show that	x – a is a
255. (i) Here a		x – a is a
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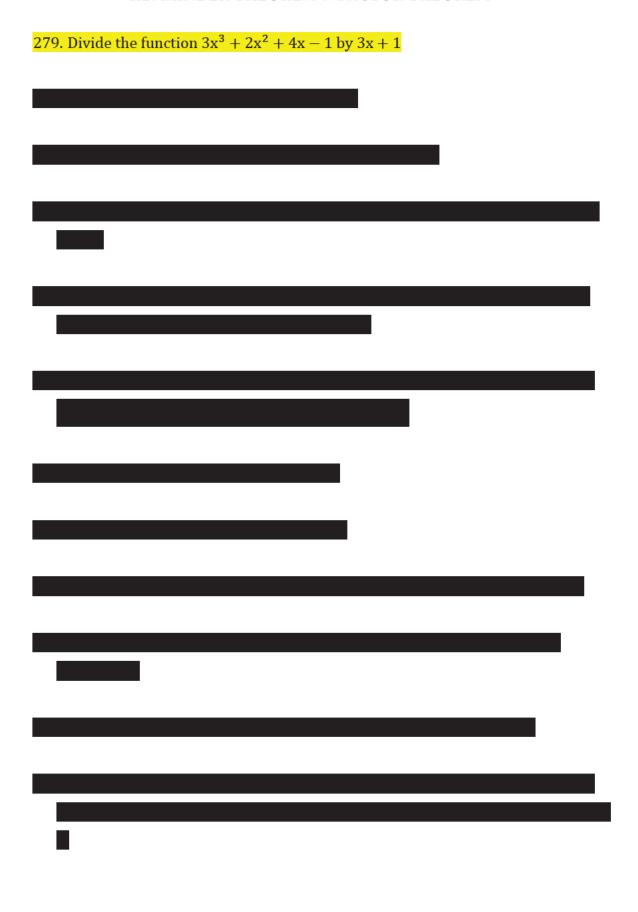
8. When	the polynomial function f (x) is divided by $a \neq 0$ , $x^2 - a^2$ , the remain
Ax + B	
	that $A = \frac{1}{2a} [f(a) - f(-a)], B = \frac{1}{2} [f(a) - f(-a)].$
	e the remainder when $f(x)$ is divided by, $x^2 - 3^2$ . If $f(x) = x^3 + x - 3$ d
the rel	<mark>nainder.</mark>

270. f(x) is a polynomial function of second degree. f(x) is divisible exactly by x+3. When divided by (x-2) and (x+1), remainders are respectively 5 and -4. Find f(x). Here f(x) = (px + q - 1) f(x). p and q are constants. If the remainder is 2x-2, when the function f(x) is divided by (x+1)(x+2), find p and q.

273. Given that  $f(x) = 4x^3 + 3x^2 + 2x + 1$ ,  $g(x) = ax^2 + bx^3 + d$  find the values that would satisfy the condition f(x) = g(x)

274. Given that  $4x^3 + 2x^2 + 3x + 17 \equiv Ax^2(x-1) + B(x-1)^2(x-2) + C(x+1)$  find the values of A,B,C that satisfy the identity.

276. Given that  $f(x) = 4x^4 + 2x^3 + x^2 - 3x + 1$  is the dividend and  $x^2 + 2x + 3$  is the divisor, find the answer (quotient) and the remainder.



295. f(x) is a polynomial of squared or higher degree of x. Given  $a \neq b$ , show that when f(x) is divided by (x - a)(x - b) remainder is  $f(a)\frac{(x-b)}{1-b}x + f(b)\frac{(x-a)}{b-a}$ 

296. If,  $f(x) = x^{10} + 2x^9 + ax^2 + bx + c$  divide by x + 1, remainder is -9 and if same function is divided by  $x^2 + x - 2$ , remainder is 4x - 1 find the values of constants a, b and c.

300. show that (x - a) is a factor of the polynomial  $f(x) = x^3 + ax^2 - a^2x - a^3$  and find the other factors.

301. when polynomial  $f(x) = x^{11} + 2x^{10} + px^2 + 2q + r$  is divided by x - 1

302. Find the remainder when  $f(x) = 2x^6 + 4x^5 + 3x^2 - 2x + 3$  is divided by (x - 1)(x + 1)(x + 2). Find the quotient when the first function is divided by (x - 1)(x + 1)(x + 2)

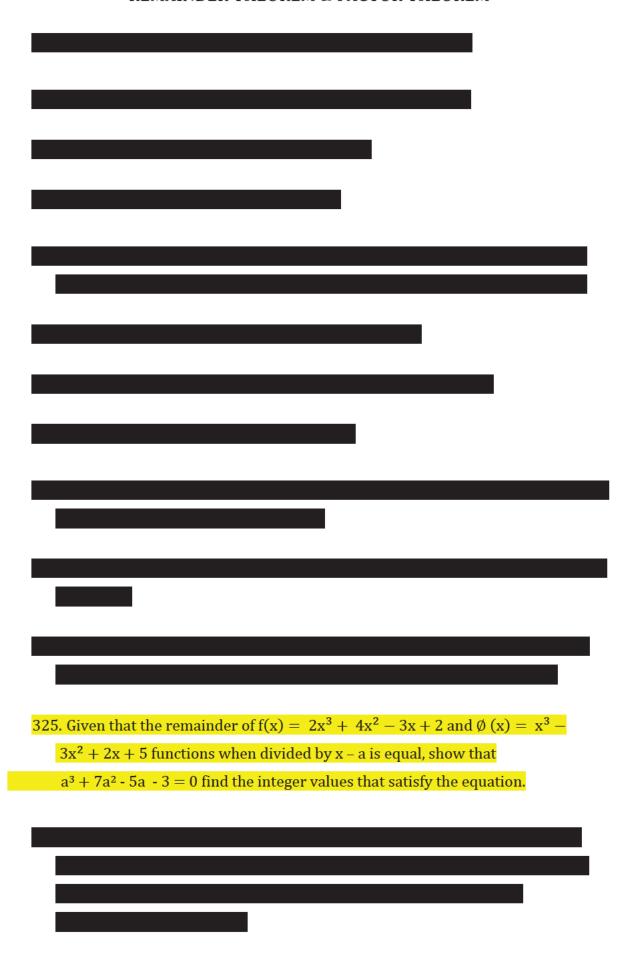
303. if x-3 is a common root of  $f(x) = 2x^3 - x^2 + 3px + 2q$  and  $g(x) = 2qx^3 + 5qx^2 + 4x - 3$  find the values of p, q and r

- 304. if n is odd positive integers, show that when  $x^n+1$  is divided by  $x^2-1$ , remainder is equal to x+1. Find the solution function (quotient) when it is divided by  $x^2-1$
- 305. Divide the polynomial  $f(x) = 2x^5 px^2 + 3x$  by (x 1)(x 2)(x 3). If the remainder does not consist of  $x^2$  find the value of p.
- 306. When the polynomial f(x) which has higher degree than 2 is  $k \neq 0$ , show that dividing by  $x^2 k^2$  gives a remainder of  $\frac{1}{2k}[f(k) f(-k)]x + \frac{1}{2}[f(k) + f(-k)]$

310. When f(x) which is a polynomial, is divided by (x-1)(x+1)(x+2) remainder is equal to A(x+1)(x+2) + B(x-1)(x+2) + C(x-1)(x+1). Find the values of A,B and C using f(-1), f(1)(-2). If  $f(x) = 2x^5 + 4x^4 + x^2 - 2x + 1$  deduce the remainder

312.

313.  $f(a, b, c) = a^3 (b - c) + b^3 (c - a) + c^3 (a - b)$  Find factor



328. (i) Given that $3x^2 + 5xy - 2y^2 + 5x - 4y + k = (lx + my + n) (lx + my + n.)$
find the constants l., m., n., k
329. (i) $x^4 - 5x^3 + 4x^2 + 5x + 1 = 0$ solve the equation.

333. (a) $f(x) \equiv x^4 - bx^3 - 11x^2 + 4(b+1)x + a$ . in this function, a and b are
constants. Show that
(i) $f(x)$ is a perfect square.
(ii) $x + 2$ is a factor of $f(x)$ . find the a and b. Find the all factors of $f(x)$

(b)	f(x) is a polynomial
	$f(x) \equiv x^5 + 3x^4 - 2x^3 + 2x^2 - 3x + 1$
	(i) Show that $x - 1$ or $x + 1$ are not factors of $f(x)$
	(ii) Find the remainder when $f(x)$ is divided by $x^2-1$
339. (i)	$x(y^4 - z^4) + y(z^4 - x^4) + z(x^4 - y^4)$ factorize
(ii)	assume that $f(x) = x^2 - 2x + 2$ and $g(x) = 6x^2 - 16x + 19$ . Find the value
	of $\lambda$ when $f(x) + \lambda g(x)$ function is converted to the form of $a(x+b)^2$
	where a and b are real constants. Based on that providing values for A,B
	and C express $f(x)$ in the form of $A(x-3)^2 + B(x+c)^3$ . Also show $g(x) =$
	$10A(x-3)^2 + 5B(x+c)^2$ find the smallest and largest values of $\frac{f(x)}{g(x)}$

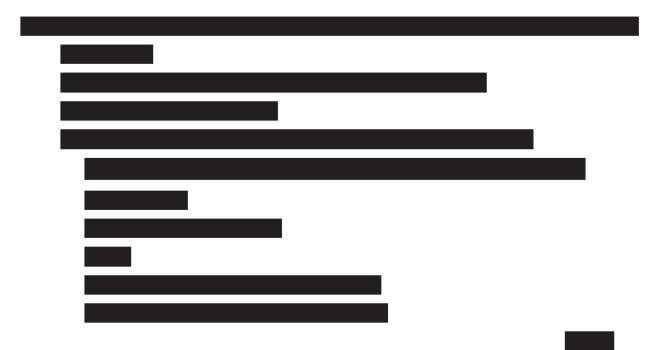


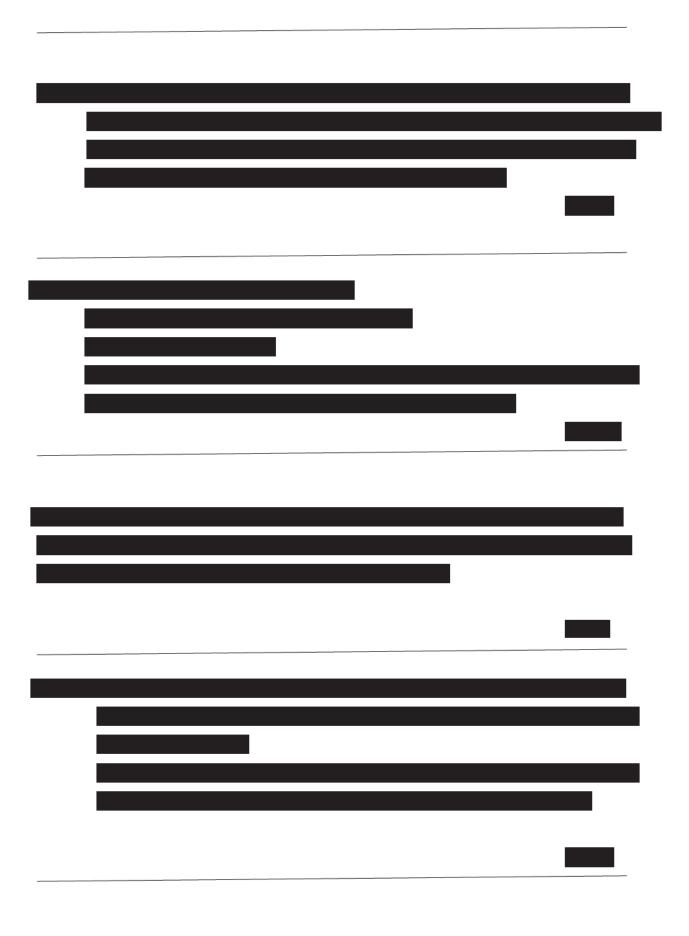
352. f(x) is a polynomial in x of degree greater than 3. When f(x) is divided by (x-1), (x-2) and (x-3), the remainders are a, b and c respectively. By

352. f(x) is a polynomial in x of degree greater than 3. When f(x) is divided by (x-1), (x-2) and (x-3), the remainders are a, b and c respectively. By repeated application of the Remainder Theorem, show that when f(x) is divided by (x-1)(x-2) (x-3), the remainder can be expressed as  $\lambda(x-1)(x-2) + \mu(x-1) + \nu$ , where  $\lambda$  and  $\mu$  are constants. Find  $\lambda$ ,  $\mu$  and  $\nu$  in terms of a, b and c.

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Prove that if a polynomial f(x) is divided by  $(x - \alpha)$  then the remainder is  $f(\alpha)$ . When the polynomial f(x) is divided by  $(x - \alpha)(x - \beta)(x - \gamma)$ , where  $\alpha, \beta$  and  $\gamma$  are unequal real numbers the remainder takes the form  $A(x - \beta)(x - \gamma) + B(x - \alpha)(x - \gamma) + C(x - \alpha)(x - \beta)$ . Express the constants A,B and C in terms of  $\alpha$   $\beta$ ,  $\gamma$ ,  $f(\alpha)$ ,  $f(\beta)$  and  $f(\gamma)$ . Hence, find the value of the constant k for which the remainder when  $x^5 - kx$  is divided by (x + 1)(x - 1)(x - 2) contains no term in x.





Let  $p(x)=x^3 + 2x^2 + 3x - 1$  and  $q(x) = x^2 + 3x + 6$ . Using the remainder 364. Let  $c(\neq 0)$  and d be real numbers, and let  $f(x) = x^3 + 4x^2 + cx + d$ .

# What's Next?



### ALGEBRA 2



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