POLYNOMIALS

$7x^{15} + 6x^{8} - 4x^{2}$

$13x^{2} - 6x - 8$

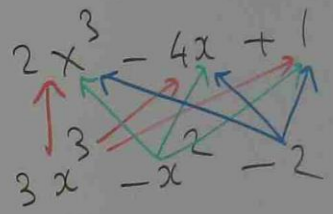
$5x + 3$ DEGREE 1

$4x^{3}$ DEGREE 3

$x^{m} \times x^{n} = x^{m+n}$

$\frac{x^{m}}{x^{n}} = x^{m-n}$

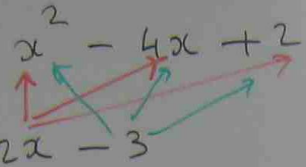
EX $(2x^{3} - 4x + 1) \times (3x^{3} - x^{2} - 2)$



$6x^{6} - 12x^{4} + 3x^{3}$
$-2x^{5} + 4x^{3} - x^{2}$
$-4x^{3} + 8x - 2$

$6x^{6} - 2x^{5} - 12x^{4} + 3x^{3} - x^{2} + 8x - 2$

EX EXPAND
$(2x-3)(x^{2} - 4x + 2)$
FIND THE COEFFICIENT OF x^{3} IN EXPANSION



$$2x^3 - 8x^2 + 4x$$
$$-3x^2 + 12x - 6$$
$$2x^3 - 11x^2 + 16x - 6$$

THE COEFFICIENT of x^3 IS 2

EX EVALUATE

$2x^2 + 7x - 9$ WHEN $x = 4$

$2(4)^2 + 7 \times 4 - 9$

$2 \times 16 + 28 - 9$

$32 + 28 - 9$

$60 - 9 = 51$

FACTORISATION

$6 = 2 \times 3$

$12 = 2 \times 6$

$12 = 4 \times 3$

$8ab + 12ac$

$a(8b + 12c)$

$a(4 \times 2b + 4 \times 3c)$

$4a(2b + 3c)$

EXERCISE

FACTORISE

(i) $4x + 6$

(ii) $9 - 12a$

(iii) $ab + a$

(iv) $6xy - 9x^2$

(v) $5x^2y - 10ax^2 + 5x^2$

(vi) $3a^2b^2 + 6ab^2$

EX FACTORISE $e^{x} + e^{-x}$

$e^{-2x} \times e^{x} = e^{-2x+x} = e^{-x}$

$e^{x} + e^{-2x} \times e^{x}$

$e^{x}(1 + e^{-2x})$

EX $6e^{2x} - 4e^{x}$

$e^{2x} = e^{x+x} = e^{x} \times e^{x}$

$6e^{x} \times e^{x} - 4e^{x}$

$e^{x}(6e^{x} - 4)$

$2e^{x}(3e^{x} - 2)$

EX $\dfrac{e^{x} + 3e^{3x}}{e^{-x} + 3e^{x}}$

$\dfrac{e^{x} + 3e^{2x+x}}{e^{-2x+x} + 3e^{x}}$

$\dfrac{e^{x} + 3e^{2x} \times e^{x}}{e^{-2x} \times e^{x} + 3e^{x}}$

$\dfrac{e^{x}(1 + 3e^{2x})}{e^{x}(e^{-2x} + 3}$

$\dfrac{1 + 3e^{2x}}{3 + e^{-2x}}$

$(a+b)(a-b)$

$a+b$

$a-b$

a^2+ab

$-ab-b^2$

a^2-b^2

$a^2-b^2=(a+b)(a-b)$

$(x+y)(x+y)$

$x+y$

$x+y$

x^2+xy

$+xy+y^2$

$x^2+2xy+y^2$

$(x^2+2xy+y^2)=(x+y)(x+y)$

Ex FACTORISE

(a) x^2+4x+3

(b) $\square^2+8\square+12$

(c) $z^2+7z+10$

(d) $x^2+8x+15$

(e) $E^2+11E+24$

(a) x^2+4x+3

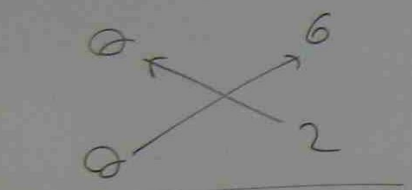
x 3

x 1

$3x+x=4x$

$(x^2+4x+3)=(x+3)(x+1)$

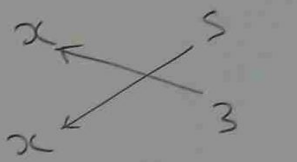
(b) $\theta^2 + 8\theta + 12$



$2\theta + 6\theta = 8\theta$

$(\theta^2 + 8\theta + 12) = (\theta + 6)(\theta + 2)$

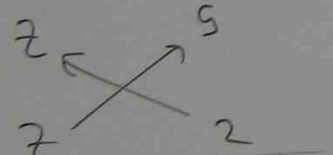
(d) $x^2 + 8x + 15$



$3x + 5x = 8x$

$(x^2 + 8x + 15) = (x + 5)(x + 3)$

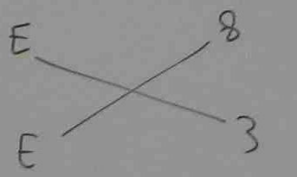
(c) $z^2 + 7z + 10$



$2z + 5z = 7z$

$(z^2 + 7z + 10) = (z + 5)(z + 2)$

(e) $E^2 + 11E + 24$



$3E + 8E = 11E$

$E^2 + 11E + 24 = (E + 8)(E + 3)$

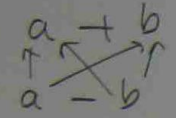
EXERCISE

FACTORISE

(a) $f^2 + 17f + 16$

(h) $\theta^2 + 12\theta + 32$

$(a+b)(a-b)$



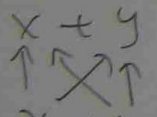
$a^2 + ab$

$-ab - b^2$

$a^2 - b^2$

$a^2 - b^2 = (a+b)(a-b)$

$(x+y)(x+y)$



$(x^2+2xy+y^2) = (x+y)(x+y)$

$x^2 + xy$

$+xy + y^2$

$x^2 + 2xy + y^2$

Ex FACTORISE

(a) $x^2 + 4x + 3$

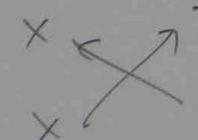
(b) $\theta^2 + 8\theta + 12$

(c) $z^2 + 7z + 10$

(d) $x^2 + 8x + 15$

(e) $E^2 + 11E + 24$

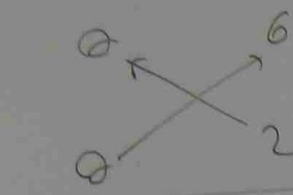
(a) $x^2 + 4x + 3$



$3x + x = 4x$

$(x^2+4x+3) = (x+3)(x+1)$

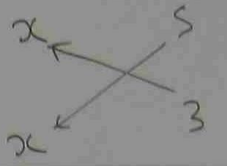
(b) $\theta^2+8\theta+12$



$2\theta+6\theta=8\theta$

$(\theta^2+8\theta+12)=(\theta+6)(\theta+2)$

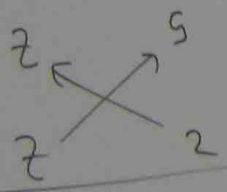
(d) $x^2+8x+15$



$3x+5x=8x$

$(x^2+8x+15)=(x+5)(x+3)$

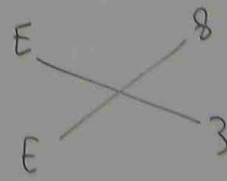
(c) $z^2+7z+10$



$2z+5z=7z$

$(z^2+7z+10)=(z+5)(z+2)$

(e) $E^2+11E+24$



$3E+8E=11E$

$E^2+11E+24=(E+8)(E+3)$

EXERCISE

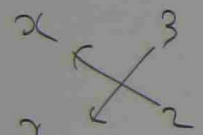
FACTORISE

(a) $f^2+17f+16$

(b) $\theta^2+12\theta+32$

EX SOLVE $\dfrac{8x^2+40x+48}{4x^2-36}$

$\dfrac{8(x^2+5x+6)}{4(x^2-9)}$



$(x+3)(x+2)$

$2x+3x=5x$

$x^2-9=(x-3)(x+3)$

$\dfrac{8(x+3)(x+2)}{4(x-3)(x+3)}$

$\dfrac{8(x+2)}{4(x-3)}$

$\dfrac{2(x+2)}{}$

EX

SOLVE (a) $\dfrac{6-2k}{3}=\dfrac{2(k-7)}{k}$

(b) $\dfrac{x-4}{3}=\dfrac{5-2x}{x-2}$

(c) $\dfrac{5}{R+3}=\dfrac{3+R}{5}$

(a) $\dfrac{6-2k}{3}=\dfrac{2(k-7)}{k}$

$k(6-2k)=3\times2(k-7)$

$6k-2k^2=6(k-7)$

$6k-2k^2=6k-42$

$-2k^2=-42$

$k^2=21$

$k=\sqrt{21}$

(b) $\frac{x-4}{3} = \frac{5-2x}{x-2}$

$(x-4)(x-2) = 3(5-2x)$

$x^2 - 4x - 2x + 8 = 15 - 6x$

$x^2 - 6x + 8 = 15 - 6x$

$x^2 - 6x + 6x = 15 - 8$

$x^2 = 7$

$x = \sqrt{7}$

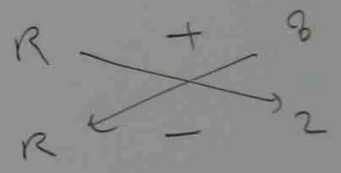
(c) $\frac{5}{R+3} = \frac{3+R}{5}$

$5 \times 5 = (R+3)(R+3)$

$25 = R^2 + 3R + 3R + 9$

$25 = R^2 + 6R + 9$

$R^2 + 6R - 16 = 0$



$8R - 2R = 6R$

$(R+8)(R-2) = 0$

$R + 8 = 0$ (OR) $R - 2 = 0$

$\therefore R = -8$ (OR) $R = 2$

APPLICATION of QUADRATIC FORMULA

$Ax^2 + Bx + C = 0$

THEN $x = \dfrac{-B \pm \sqrt{B^2 - 4AC}}{2A}$

EX SOLVE $(x-7)(x+2) = 4x - 1$

$x^2 - 7x + 2x - 14 = 4x - 1$

$x^2 - 5x - 14 = 4x - 1$

$x^2 - 5x - 14 - 4x + 1 = 0$

$x^2 - 9x - 13 = 0$

$Ax^2 + Bx + C = 0$

$A = 1, \quad B = -9, \quad C = -13$

$x = \dfrac{-(-9) \pm \sqrt{(-9)^2 - 4 \times 1 \times (-13)}}{2 \times 1}$

$= \dfrac{9 \pm \sqrt{81 + 52}}{2}$

$= \dfrac{9 \pm \sqrt{133}}{2}$

$= \dfrac{9 \pm 11.53}{2}$

$= \dfrac{9 + 11.53}{2}$ (OR) $\dfrac{9 - 11.53}{2}$

$= \dfrac{20.53}{2}$ (OR) $-\dfrac{2.53}{2}$

$= 10.265$ (OR) -1.265

EXERCISE

(1) SOLVE $50E^2 + 150E - 100 = 0$

(2) SOLVE $x^2 + 2x - 5 = 0$

FUNCTIONS AND THEIR GRAPHS

$$f(x) = x - 3$$

IF $x = 1 \longrightarrow f(1) = 1 - 3 = -2$

$x = 2 \longrightarrow f(2) = 2 - 3 = -1$

$x = 3 \longrightarrow f(3) = 3 - 3 = 0$

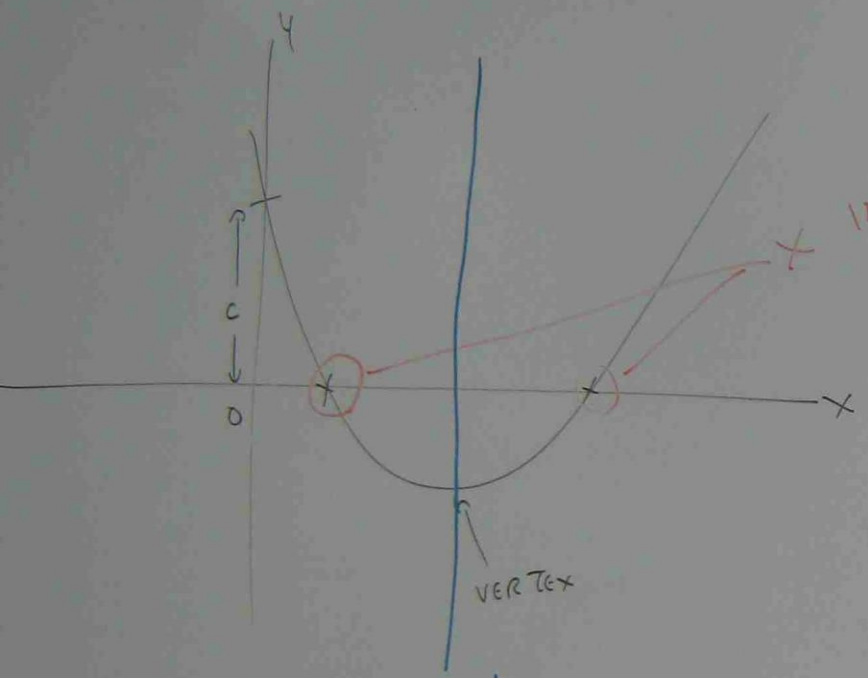
$$g(x) = 4 + x^2$$

IF $x = 1 \longrightarrow g(1) = 4 + 1^2 = 5$

$x = 2 \longrightarrow g(2) = 4 + 2^2 = 8$

$x = 3 \longrightarrow g(3) = 4 + 3^2 = 13$

PLOTTING THE GRAPH FOR EQUATION $y = ax^2 + bx + c$



$X = \frac{-b}{2a}$

(AXIS OF SYMMETRY)

plot $y = 2x^2 - 12x + 13$

compare $ax^2 + bx + c$

$\therefore a = 2, \quad b = -12, \quad c = 13$

STEP(1)

FIND AXIS OF SYMMETRY

$$\text{AXIS of SYMMETRY} = \frac{-b}{2a} = \frac{-(-12)}{2 \times 2} = 3$$

Y VALUE AT AXIS OF SYMMETRY

$y = 2x^2 - 12x + 3$

$y = 2(3)^2 - 12 \times 3 + 3$

$= -5$

$X = 3$ (AXIS OF SYMMETRY)

VERTEX IS LOCATED AT $Y = -5$

STEP ② FIND X AXIS CROSSINGS

$y = 0$

FIND X VALUE

$y = 2x^2 - 12x + 13$

$2x^2 - 12x + 13 = 0$

$Ax^2 + Bx + C = 0$

$A = 2, \quad B = -12, \quad C = 13$

$$X = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

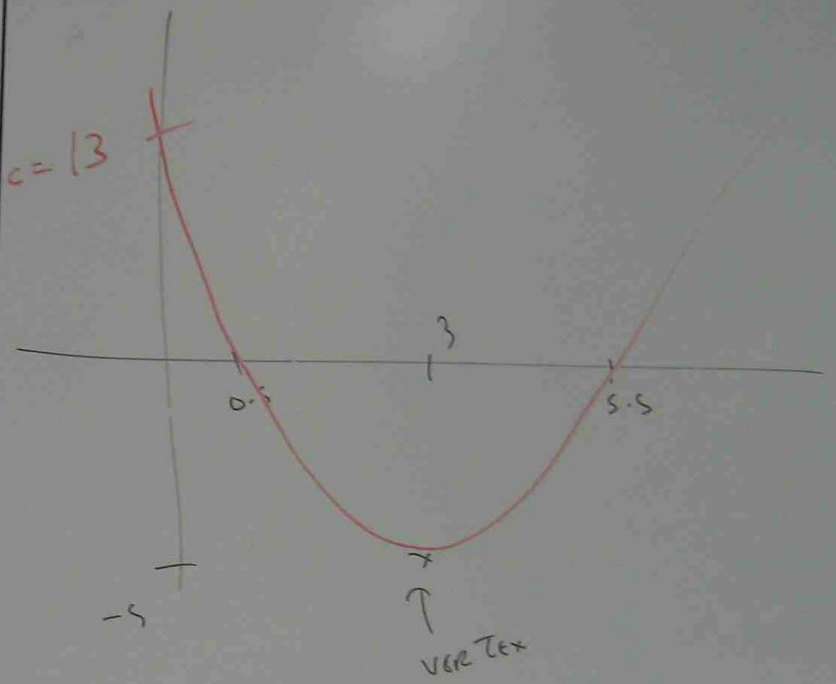
$$= \frac{-(-12) \pm \sqrt{(-12)^2 - 4 \times 2 \times 13}}{2 \times 2}$$

$$= \frac{12 \pm \sqrt{100}}{4}$$

$$= \frac{12 \pm 10}{4}$$

$$= \frac{12+10}{4} \text{ (OR) } \frac{12-10}{4}$$

$= 5.5$ (OR) 0.5



(b) $\frac{x-4}{3} = \frac{5-2x}{x-2}$

$(x-4)(x-2) = 3(5-2x)$

$x^2 - 4x - 2x + 8 = 15 - 6x$

$x^2 - 6x + 8 = 15 - 6x$

$x^2 - 6x + 6x = 15 - 8$

$x^2 = 7$

$x = \sqrt{7}$

(c) $\frac{5}{R+3} = \frac{3+R}{5}$

$5 \times 5 = (R+3)(R+3)$

$25 = R^2 + 3R + 3R + 9$

$25 = R^2 + 6R + 9$

$R^2 + 6R - 16 = 0$

$R \quad + \quad 8$

$R \quad - \quad 2$

$8R - 2R = 6R$

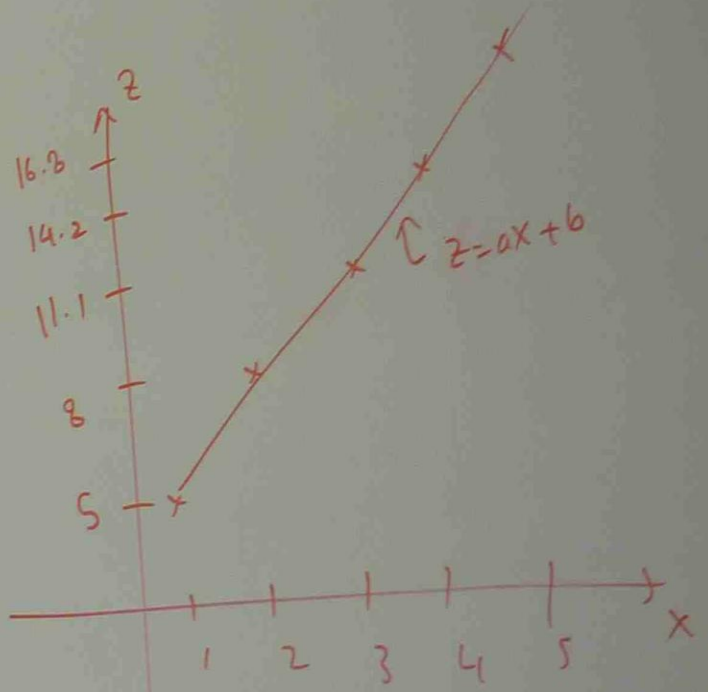
$(R+8)(R-2) = 0$

$R + 8 = 0$ (OR) $R - 2 = 0$

$\therefore R = -8$ (OR) $R = 2$

pb THE FOLLOWING VALUES of x AND y ARE BELIEVED TO SATISFY THE EQUATION OF $y = ax^2 + bx$. FIND A LINEAR EQUATION THAT SUITS THIS INFORMATION AND SO EVALUATE a & b.

x	1	2	3	4	5
y	5	16	34	57	84

$$z = \frac{y}{x} = \frac{ax^2 + bx}{x} = ax + b$$

x	1	2	3	4	5
$z = \frac{y}{x}$	$5/1 = 5$	$16/2 = 8$	$\frac{34}{3} = 11.1$	$\frac{57}{4} = 14.2$	$\frac{84}{5} = 16.8$