Questions From Homework

① b) $x^2-9x+14$ $-2\times-7=14$, $-2+-7=-9$

$(x-7)(x-2)$

① f) $6y^2-11y+3$ $-2\times-9=18$, $-2+-9=-11$

$(y-\frac{2}{6})(y-\frac{9}{6})$

$(y-\frac{1}{3})(y-\frac{3}{2})$

$(3y-1)(2y-3)$

1, 8, 27, 64, 125.... perfect cubes

② c) t^3+64 $a^3+b^3=(a+b)(a^2-ab+b^2)$

$(t+4)(t^2-4t+16)$

b) x^3-1 $a^3-b^3=(a-b)(a^2+ab+b^2)$

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

③ a) $(x^3-x^2)(16x+16)$

$x^2(x-1)-16(x-1)$

$(x-1)(x^2-16)$ ← Diff of square $a^2-b^2=(a-b)(a+b)$

$(x-1)(x+4)(x-4)$

③ d) $x^3+2x^2-11x-12$ $x=-1$

$(-1)^3+2(-1)^2-11(-1)-12$ $(x+1)$ is a factor

$-1+2+11-12$

0

$4\ \frac{x^3}{4}=-b$, $+-3=1$

$x+1 \overline{)\ x^3+2x^2-11x-12}$ $\quad x^2+x-12$

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

$x^2-11x-12$

$-(x^2+x)$

$-12x-12$

$-(-12x-12)$

$(x+1)(x^2+x-12)$

$(x+1)(x+4)(x-3)$

Questions From Homework

① e) $5x^2+8x+6$ $10\times 3=30$, $10+3=13$

$(x+10)(x+3)$

$(x+2)(5x+3)$

① g) t^3+2t^2-3t $-1\times 3=-3$, $-1+3=2$

$t(t^2+2t-3)$

$t(t-1)(t+3)$

② f) x^6+8 $a^3+b^3=(a+b)(a^2-ab+b^2)$

$(x^2+2)(x^4-2x^2+4)$

② g) x^4-16

$(x^2+4)(x^2-4)$

$(x^2+4)(x+2)(x-2)$

③ b) x^3+0x^2-7x+6 $x=1$

$(1)^3+0(1)^2-7(1)+6$ $(x-1)$ is a factor

$1+0-7+6$

0

$$x-1 \;\overline{)\; x^3+0x^2-7x+6}$$

x^2+x-6

$-(x^3-x^2)$

x^2-7x+6

$-(x^2-x)$

$-6x+6$

$-(-6x+6)$

0

$(x-1)(x^2+x-6)$

$(x-1)(x+3)(x-2)$

Questions From Homework

③ b) $x^3 - 7x + 6$

$x^3 + 0x^2 - 7x + 6$

$(2)^3 + 0(2)^2 - 7(2) + 6$

$8 - 14 + 6$

0

$x = 2$

$x - 2 = 0$

$x - 2$ is a factor

x-value

2 |

coefficients / constant term of polynomial

1	0	-7	6
	2	4	-6
1	2	-3	0

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

simple trinomial.

$-1 + 3 = 2$

$-1 \times 3 = -3$

-3

-1×3

$(x-2)(x-1)(x+3)$

Questions From Homework

③ e) $4x^3+12x^2+5x-6$

$x=-2$

$x+2=0$

$4(-2)^3+12(-2)^2+5(-2)-6$

$-32+48-10-6=0$

$-2+6=4$

$-2\times 6=-12$

$x+2 \;\overline{)\; 4x^3+12x^2+5x-6}$

$4x^2+4x-3$

$-(4x^3+8x^2)$

$4x^2+5x-6$

$-(4x^2+8x)$

$-3x-6$

$-(-3x-6)$

0

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

$(x+2)\left(x-\frac{2}{4}\right)\left(x+\frac{6}{4}\right)$

$(x+2)\left(x-\frac{1}{2}\right)\left(x+\frac{3}{2}\right)$

$(x+2)(2x-1)(2x+3)$

② h) r^8-1

x^2-4

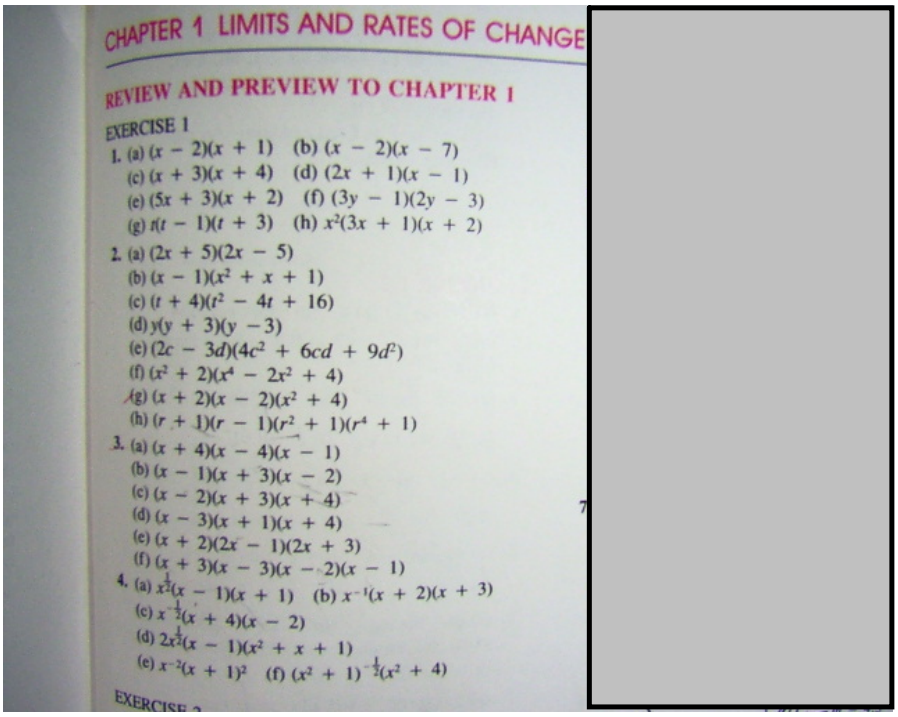
$(x-2)(x+2)$

$(r^4-1)(r^4+1)$

$(r^2-1)(r^2+1)(r^4+1)$

$(r-1)(r+1)(r^2+1)(r^4+1)$

Answers to short sheet



CHAPTER 1 LIMITS AND RATES OF CHANGE

REVIEW AND PREVIEW TO CHAPTER 1

EXERCISE 1

1. (a) $(x - 2)(x + 1)$ (b) $(x - 2)(x - 7)$
   (c) $(x + 3)(x + 4)$ (d) $(2x + 1)(x - 1)$
   (e) $(5x + 3)(x + 2)$ (f) $(3y - 1)(2y - 3)$
   (g) $t(t - 1)(t + 3)$ (h) $x^2(3x + 1)(x + 2)$
2. (a) $(2x + 5)(2x - 5)$
   (b) $(x - 1)(x^2 + x + 1)$
   (c) $(t + 4)(t^2 - 4t + 16)$
   (d) $y(y + 3)(y - 3)$
   (e) $(2c - 3d)(4c^2 + 6cd + 9d^2)$
   (f) $(x^2 + 2)(x^4 - 2x^2 + 4)$
   (g) $(x + 2)(x - 2)(x^2 + 4)$
   (h) $(r + 1)(r - 1)(r^2 + 1)(r^4 + 1)$
3. (a) $(x + 4)(x - 4)(x - 1)$
   (b) $(x - 1)(x + 3)(x - 2)$
   (c) $(x - 2)(x + 3)(x + 4)$
   (d) $(x - 3)(x + 1)(x + 4)$
   (e) $(x + 2)(2x - 1)(2x + 3)$
   (f) $(x + 3)(x - 3)(x - 2)(x - 1)$
4. (a) $x^{\frac{1}{2}}(x - 1)(x + 1)$ (b) $x^{-1}(x + 2)(x + 3)$
   (c) $x^{-\frac{1}{3}}(x + 4)(x - 2)$
   (d) $2x^{\frac{1}{3}}(x - 1)(x^2 + x + 1)$
   (e) $x^{-2}(x + 1)^2$ (f) $(x^2 + 1)^{-\frac{1}{2}}(x^2 + 4)$

EXERCISE 2

Synthetic Substitution

Factor using synthetic substitution $x^3 - 7x^2 - 4x + 28$

Find a value of x that makes it equal 0

$(2)^3 - 7(2)^2 - 4(2) + 28$

$8 - 28 - 8 + 28 = 0$

(x-value) **(Coefficients of the polynomial)**

2	1	-7	-4	28
		2	-10	-28
	1	-5	-14	

$(x-2)(x^2-5x-14)$

$(x-2)(x-7)(x+2)$

$-7 \times 2 = -14$

$-7 + 2 = -5$

Bring down the first coefficient

Multiply the first coefficient by the *x-value* and place under the second coefficient. ADD.

Repeat the steps. The coefficients of the other factor are in the bottom row.

$(x^3 - 7x^2)(4x + 28)$

$x^2(x-7) - 4(x-7)$

$(x-7)(x^2-4)$

$(x-7)(x+2)(x-2)$

$x^3 + 5x^2 - 2x - 24$ **Find a value of x that makes it equal 0**

$(-3)^3 + 5(-3)^2 - 2(-3) - 24$

$-27 + 45 + 6 - 24 = 0$

(x-value) **(Coefficients of the polynomial)**

-3 | 1 5 -2 -24

	-3	-6	24
1	2	-8	

$(x+3)(x^2+2x-8)$

$-2 \times 4 = -8$

$-2 + 4 = 2$

$(x+3)(x-2)(x+4)$

Homework

(29) a) $x^3 - 4x^2 + x + 6 = 0$ $x = -1$ is a root

$(-1)^3 - 4(-1)^2 + (-1) + 6 = 0$

$-1 - 4 - 1 + 6 = 0$

$0 = 0$

(31) a) $(x^3 - x^2 - 14x + 24) \div (x - 2)$

2 | 1 -1 -14 24

2 2 -24

1 1 -12

$(x-2)(x^2 + x - 12)$

$(x-2)(x+4)(x-3)$

Types of polynomials:

1 term → monomial

2 terms → binomial

3 terms → trinomial

4 or more → polynomial

Find the product:

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

$2x^3+3x^2-4x+4x^2+6x-8$

$\boxed{2x^3+7x^2+2x-8}$

Factor:

$2x^2+7x+6$ $\quad 3+4=7$, $3\times 4=12$

$(x+3)(x+4)$

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

Solve:

$2x^2+7x+6=0$ $\quad 3+4=7$, $3\times 4=12$

$(x+3)(x+4)=0$

$(2x+3)(x+2)=0$

$2x+3=0$ | $x+2=0$

$2x=-3$ | $\boxed{x=-2}$

$\boxed{x=-3/2}$

Solve for y

$-5y+8 \geq y-7$

$-5y-y \geq -7-8$

$\frac{-6y}{-6} \geq \frac{-15}{-6}$

$y \leq \frac{5}{2}$

$-5y+8 \geq y-7$

$8+7 \geq y+5y$

$\frac{15}{6} \geq \frac{6y}{6}$

$\frac{5}{2} \geq y$

$x^4 + 6x^2 + 8 = 0$

$(x^2+2)(x^2+4) = 0$

$x^2+2=0$ $\quad x^2+4=0$

$x^2=-2$ $\quad x^2=-4$

$2+4=6$

$2\times4=8$

8

1x8

2x4

ANSWERS

Factoring All Polynomials

1. $(3x+2)(3x-2)$
2. $(x+4)(x^2-4x+16)$
3. $50(2x+1)(2x-1)$
4. $7x(x+1)(x+1)$
5. Prime
6. $3(x^2+27)$
7. $(2x-3)(x+1)$
8. $(x+5)(x-2)$
9. $(x+4)(x+4)$
10. $(2x-5)(2x-5)$
11. $(x-2)(2x-1)$
12. $(3x+4)(x-5)$
13. $(x^2-5)(x-3)$
14. $(2x+7)(2x-7)$
15. $(3x^2+4)(x^2-5)$
16. $(x-9)(x-9)$
17. $(4x+9)(4x-9)$
18. $(x^2+2)(2x-3)$
19. $(2x-3y)(4x^2+6xy+9y^2)$
20. $(x^2-3)(x+1)(x-1)$
21. $6ab(2x^2+ax^3-5b^2)$
22. $5a(a-5)$
23. $3a^3bm(ab-25m^3)$
24. $3(x+4)(x-4)$
25. $8(x-2)(x^2+2x+4)$
26. $(x+6)(x-3)$
27. $50(2x+1)(2x-1)$
28. $(6x^2+1)(3x+5)$
29. $3(x+2)(x^2-2x+4)$
30. $2(5x^2-1)(x-2)$
31. $(x-7)(5x+3)$
32. $(2x+9)(2x+1)$
33. $5(x^2+5)(3x-5)$
34. $(x+7)(x+8)$
35. $7x(2x+1)(2x-1)$
36. $(6x+1)(36x^2-6x+1)$
37. $(2x-7)(6x-1)$
38. $3(2x+7)$
39. $(2x^2y+3z)(2x^2y-3z)(4x^4y^2+9z^2)$
40. $(9x-1)(2x^2+3)$
41. $4(2x-1)(4x^2+2x+1)$
42. $(4x-5)(2x+5)$
43. $(x+9)(x-4)$
44. $2(x+6)(x+4)$

$a^3+b^3 = (a+b)(a^2-ab+b^2)$ ✓ sum of cubes

$a^3-b^3 = (a-b)(a^2+ab+b^2)$ diff. of cubes

$a^2-b^2 = (a-b)(a+b)$ diff. of squares

② x^3+64

$(x)^3+(4)^3$ $a=x$, $b=4$ } sum of cubes

$(x+4)(x^2-4x+16)$

$x^2 - 4$

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

$(x-2)(x+2)$

$a = x$

$b = 2$

$4x^2 - 1$

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

$(2x-1)(2x+1)$

$a = 2x$

$b = 1$

$4x^2 + 0x - 1$

$2 + -2 = 0$

$2 \times -2 = -4$

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

$(x+\frac{1}{2})(x-\frac{1}{2})$

$(2x+1)(2x-1)$

① $2x^2 - x - 3$

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

$2x(x+1) - 3(x+1)$

term 1 term 2

$(x+1)(2x-3)$

$2 + -3 = -1$

$2 \times -3 = -6$

-6

1×-6

2×-3

$2x^2 - x - 3$

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

2 2

$(x+1)(2x-3)$

⑭ $3x^4 - 11x^2 - 20$

$(x^2+4)(x^2-15)$

3 3

$(3x^2+4)(x^2-5)$

$4 + -15 = -11$

$4 \times -15 = -60$

60

1×-60

2×-30

3×-20

4×-15

5×-18

6×-10