

CHAPTER 0

REVIEW OF ALGEBRA

05. Factoring

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1 Summary

Rules for Factoring

Expression	Factored Form	Type of Factoring
$xy + xz$	$x(y + z)$	<i>Common Factor</i>
$x^2 + (a + b)x + ab$	$(x + a)(x + b)$	-
$abx^2 + (ad + cb)x + cd$	$(ax + c)(bx + d)$	-
$x^2 + 2ax + a^2$	$(x + a)^2$	<i>Perfect Square Trinomial</i>
$x^2 - 2ax + a^2$	$(x - a)^2$	<i>Perfect Square Trinomial</i>
$x^2 - a^2$	$(x + a)(x - a)$	<i>Difference of Two Squares</i>
$x^3 + a^3$	$(x + a)(x^2 - ax + a^2)$	<i>Sum of Two Cubes</i>
$x^3 - a^3$	$(x - a)(x^2 + ax + a^2)$	<i>Difference of Two Cubes</i>

Always factor as completely as you can.

For example:

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

Examples

Expression	Factored Form	Type of Factoring
$x^2 + 8x + 16$	$(x + 4)^2$	4. Perfect Square Trinomial
$9x^2 + 9x + 2$	$(3x + 1)(3x + 2)$	3. -
$6y^3 + 3y^2 - 18y$	$3y(2y^2 + y - 6)$	1. Common Factor
$6y^3 + 3y^2 - 18y$	$3y(2y + 3)(y - 2)$	3. -
$x^2 - 6x + 9$	$(x - 3)^2$	5. Perfect Square Trinomial
$z^{\frac{1}{4}} + z^{\frac{5}{4}}$	$z^{\frac{1}{4}}(1 + z)$	1. Common Factor
$x^4 - 1$	$(x^2 + 1)(x^2 - 1)$	6. Difference of Two Squares
$x^4 - 1$	$(x^2 + 1)(x + 1)(x - 1)$	6. Difference of Two Squares
$x^{\frac{2}{3}} - 5x^{\frac{1}{3}} + 4$	$(x^{\frac{1}{3}} - 4)(x^{\frac{1}{3}} - 1)$	2. -
$ax^2 - ay^2 + bx^2 - by^2$	$a(x^2 - y^2) + b(x^2 - y^2)$	1. Common Factor
$ax^2 - ay^2 + bx^2 - by^2$	$(a + b)(x^2 - y^2)$	1. Common Factor
$ax^2 - ay^2 + bx^2 - by^2$	$(a + b)(x + y)(x - y)$	6. Difference of Two Squares
$8 - x^3$	$(2)^3 - x^3$	8. Difference of Two Cubes
$8 - x^3$	$(x^2 + 2x + 4)(-x + 2)$	8. Difference of Two Cubes
$x^6 - y^6$	$(x^3)^2 - (y^3)^2$	-
$x^6 - y^6$	$(x^3 + y^3)(x^3 - y^3)$	6. Difference of Two Squares
$x^6 - y^6$	$(x + y)(x^2 - xy + y^2)(x - y)(x^2 + xy + y^2)$	7, 8

2 Problems 0.5

Factor the following expressions completely

1. $5bx + 5b$

- $5b(x + 1)$

2. $6y^2 - 4y$

- $y(6y - 4)$

- $2y(3y - 2)$

3. $10xy + 5xz$

- $5x(2y + z)$

4. $3x^2y - 9x^3y^3$

- $3(x^2y - 3x^3y^3)$
 - $3(x^2y(1 - 3xy^2))$
 - $3x^2y(1 - 3xy^2)$
5. $3a^3bcd^2 - 4ab^3c^2d^2 + 2a^3bc^4d^3$
- $abcd^2(3a^2 - 4b^2c + 2a^2c^3d)$
6. $5r^2st^2 + 10r^3s^2t^3 - 15r^2t^2$
- $5r^2t^2(s + 2rs^2t - 3)$
7. $z^2 - 49$
- $(z + 7)(z - 7)$
8. $x^2 - x - 6$
- $(x - 3)(x + 2)$
9. $p^2 + 4p + 3$
- $(p + 3)(p + 1)$
10. $t^2 - t - 12$
- $(t - 4)(t + 3)$
11. $25y^2 - 4$
- $(5y + 2)(5y - 2)$
12. $x^2 + 2x - 24$
- $(x + 6)(x - 4)$
13. $a^2 + 12a + 35$
- $(a + 7)(a + 5)$
14. $4t^2 - 9s^2$
- $(2t + 3s)(2t - 3s)$
15. $y^2 + 8y + 15$
- $(y + 5)(y + 3)$
16. $t^2 - 18t + 72$
- $(t - 6)(t - 12)$
17. $5x^2 + 25x + 30$
- $5(x^2 + 5x + 6)$
 - $5(x + 3)(x + 2)$
18. $3t^2 + 12t - 15$
- $3(t^2 + 4t - 5)$

- $3(t+5)(t-1)$

19. $3x^2 - 3$

- $3(x^2 - 1)$

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

20. $6x^2 + 31x + 35$

- $6x^2 + 21x + 10x + 35$

- $(6x^2 + 21x) + (10x + 35)$

- ~~$3x(x+7) + 5(2x+7)$~~

wrong factoring, because of wrong grouping
in second step.

- $(6x^2 + 10x) + (21x + 35)$

- $2x(3x+5) + 7(3x+5)$

- $(2x+7)(3x+5)$