# IS 1006 – Discrete Mathematics

## Tutorial 03 – *Introduction to Basic Algebra*

### 01. Collecting Coefficients

01.1. Monomial

a). $2x + 5x^2 - 10x - 20x^2$

b). $7x^3 - 5x^2 + \frac{1}{x} + \frac{20x}{5x^2+7x} + 10x^3$

01.2. Binomial

c). $8x^2 - 4xy + 5xy - 9x^2$

d). $\frac{1}{x} + \frac{4}{xy} + \frac{6xy+5y^2}{xy} + x^2 - xy^2$

01.3. Trinomial

e). $5pqr + 7p^2yz - 9xyz^3 + 15xy^2z$

### 02. Factorize the following algebraic expressions

a) $6x + 24$

b) $8x^2 - 4x$

c) $6xy + 10x^2y$

d) $m^4 - 3m^2$

e) $6x^2 + 8x + 12yx$

For the following expressions, factorize the first pair and then the second pair.

f) $8m^2 - 12m + 10m - 15$

g) $x^2 + 5x + 2x + 10$

h) $p^2 - 4p + 3p - 12$

i) $2t^2 - 4t + t - 2$

j) $6y^2 - 15y + 4y - 10$

k) $3xy + 9xy^2 + 6x^2y$

l) $9a^2b + 3a^2 + 5b + 5b^2a$

m) $10x^2 + 5x + 2xy + y$

n) $x^2 + 2xy + 5x^3 + 10x^2y$

03. Expand the following and simplify.

a) $(x + 7)(x - 7)$

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

c) $(3m - 4)(3m + 4)$

d) $(5y + 6)(6 - 5y)$

e) $(7 + 2t)(2t - 7)$

04. Factorize the following

a) $x^2 - 16$

b) $y^2 - 49$

c) $9a^2 - 36$

d) $4t^2 - 25$

e) $16 - y^2$

f) $y^2 - 6y + 9$

g) $x^2 - 10x + 25$

h) $x^2 + 8x + 16$

i) $t^2 - 30t + 225$

j) $4p^2 - 20m + 25$

05. Which of the following algebraic expression is a quadratic?

a) $x^2 - 3x + 4$
b) $4x^2 + 6x - 1$
c) $x^3 - 6x + 2$
d) $x^2 - 4$

06. Factorize the following Quadratics.

a) $x^2 + 4x + 3$
b) $x^2 + 15x + 44$
c) $y^2 + 11y - 26$
d) $a^2 + 7a - 30$
e) $t^2 + 2t - 15$
f) $t^2 - 2t - 15$
g) $2x^2 + 11x + 12$
h) $3x^2 + 16x + 5$
i) $6x^2 + 17x + 12$
j) $12r^2 + 11r + 2$
k) $2s^2 + s - 7$
l) $2m^2 + 4m + 1$

07. Factorize and simplify the following algebraic expressions.

a) $\frac{x^2-9}{x-3}$
b) $\frac{x^2+3x}{x+3}$
c) $\frac{k^2+3k+2}{3k+6}$
d) $\frac{y^2-16}{2y+8}$
e) $\frac{x^2-25}{x^2+3x+10}$
f) $\frac{2x^2-32}{x^2+6x+8}$
g) $\frac{2x^2-x-6}{x^2+x-6}$

08. Simplify the following.

a) $\frac{3}{x+2} + \frac{5x}{x+3}$
b) $\frac{4x}{x-5} + \frac{2}{x+2}$
c) $\frac{x+1}{x+2} + \frac{x+3}{x+4}$
d) $\frac{6}{x^2+5x+6} + \frac{2}{x^2+8x+15}$
e) $\frac{x+3}{x^2+6x+9} - \frac{2}{x+3}$
f) $\frac{x^2+8x+15}{x^2+7x+10} - \frac{x+3}{x+2}$
g) $\frac{x^2-9}{2x+6} - \frac{x^2}{x-3}$
h) $\frac{3x}{x^2+6x} - \frac{2x+1}{x+6}$

09. Solve the following quadratic equations.

a) $x^2 - 6x + 8 = 0$
b) $x^2 + 8x + 15 = 0$
c) $x^2 + 9x - 22 = 0$
d) $x^2 - 7x + 12 = 0$
e) $2x^2 - x - 6 = 0$
f) $2x^2 - 13x - 7 = 0$
g) $7x^2 + 13x - 2 = 0$
h) $x^2 - 18x + 77 = 0$