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Algebra Lab Module 2

From the previous chapter on exponents:

All letters represent real numbers, and they are nonzero if they make the denominators zero.

5. Simplify each expression, and write the result in terms of positive exponents and radicals:

In groups:

(a) $\sqrt{x^7}$

(b) $\sqrt[3]{x^7}$

(c) $\sqrt[3]{250a^2b^6c^{13}}$

(d) $\sqrt{\dfrac{x^9}{36}}$

(e) $4\sqrt[3]{\dfrac{p^3z^8}{8}}$

(f) $\sqrt{10}\cdot\sqrt{14}$

(g) $\sqrt[3]{x^2y}\cdot\sqrt[3]{xy^2}$

(h) $\left(3\sqrt[4]{x^3}\right)\left(-5\sqrt[4]{x^3}\right)$

(i) $\left(-\dfrac{1}{2}\sqrt[3]{6x^2y^2z}\right)\left(\dfrac{4}{3}\sqrt[3]{4x^2z^2}\right)$

(j) $\sqrt[5]{x\sqrt[3]{x^2}}$

Individually:

(a) $\sqrt[4]{x^7}$

(b) $\sqrt[8]{x^7}$

(c) $\sqrt{24}$

(d) $\sqrt[3]{24}$

(e) $\sqrt{54}$

(f) $\sqrt[3]{54}$

(g) $\sqrt[4]{40x^3y^9z^{14}}$

(h) $\sqrt[4]{243p^{19}q^{10}}$

(i) $\sqrt{84(a-2)^3}$

(j) $\sqrt{12(x+42)^5}$

(k) $\sqrt{\dfrac{a^{13}}{64}}$

(l) $8\sqrt[3]{\dfrac{x^6y^7}{64}}$

(m) $\sqrt{6}\cdot\sqrt{21}$

(n) $\sqrt[4]{p^3q}\cdot\sqrt[4]{pq^3}$

(o) $\left(7\sqrt[6]{a^5}\right)\left(-2\sqrt[6]{a^5}\right)$

(p) $\left(\dfrac{1}{6}\sqrt[3]{9p^2q^5r}\right)\left(-\dfrac{3}{4}\sqrt[3]{6p^2qz^4}\right)$

(q) $\sqrt[5]{x^6y^5}\cdot\sqrt[4]{x}$

(r) $\sqrt[4]{p^3q}\cdot\sqrt[3]{pq^2}$

(s) $\sqrt[6]{a\sqrt[4]{a^3}}$

(t) $\sqrt{x\sqrt{x\sqrt{x}}}$

(u) $\sqrt[3]{x\sqrt[3]{x\sqrt[3]{x}}}$

6. Add or subtract as indicated. Leave your answers as simplified as possible:
In groups:

(a) $3\sqrt[3]{2x^2}-9\sqrt[3]{2x^2}+\sqrt[3]{2x^2}$

(b) $-3x\sqrt[3]{16xy^4}+xy\sqrt[3]{54xy}-5\sqrt[3]{250x^4y^4}$

Individually:

(a) $\dfrac{1}{5}\sqrt{50}-\dfrac{7}{3}\sqrt{18}+\dfrac{5}{6}\sqrt{72}$

(b) $\dfrac{2}{5}\sqrt{75}-\dfrac{2}{3}\sqrt{27}-\dfrac{1}{2}\sqrt{12}$

(c) $8\sqrt[4]{32p^5q^6}-5q\sqrt[4]{2p^5q^2}-pq\sqrt[4]{162pq^2}$

(d) $-\dfrac{1}{2}\sqrt{8x}+\dfrac{3}{7}\sqrt{98x}$

Chapter 2: Factoring

1. Factor the Greatest Common Factor (GCF).
   Groups:

   (a) $10x^7 - 40x^6 + 15x^5$
   (b) $5a(b - 6c) + 7(b - 6c)$

   Individually:

   (c) $21x^3y^6 - 14x^4y^5 + 35x^5y^2$
   (d) $8p^3(4k + 9) + 4p^2(4k + 9)$
   (e) $36a^5b^8 + 18a^4b^6 - 27a^3b^7$
   (f) $-7q^3p^2 + 49p^4q^3$
   (g) $-8y^4 + 24y^3 - 16y^2$

2. Factor out the indicated common factor.
   Groups:

   (a) Factor out a -1 from $a - b$
   (b) Factor out a -1 from $-5k^4 - 15c^3 + 20$
   (c) Factor out a -5 from $-15a^2 - 10y + 25$
   (d) Factor out a 3 from $-6y^2 + 12y + 9$
   (e) Factor out $-7x^3y$ from $-14x^4y^3 + 21x^3y^2 - 7x^3y$

   Individually:

   (f) Factor out a -1 from $-3y - 2x$
   (g) Factor out a -1 from $3y^2 - 5x^3 + 17$
   (h) Factor out a 5 from $-15a^2 - 10y + 25$
   (i) Factor out a -3 from $-6y^2 + 12y + 9$
   (j) Factor out $-4a^2b$ from $-12a^3b^2 - 8a^4b^3 + 4a^2b$

3. Factor by grouping
   Groups:

   (a) $6xy + 9y + 14x + 21$
   (b) $12a^3 - 9a^2 - 40a + 30$

   Individually:

   (c) $8xy + 18x + 20y + 45$
   (d) $30p^3 - 35p^2 - 24p + 28$
   (e) $ab - 8b + 4a - 2b^2$
   (f) $7x - 6y^2 + xy - 42y$

Algebra Lab Module 3

From the previous chapter on factoring:

4. Factor the following trinomials. You start by trying to factor any GCF, and then you may use any other method you know such as the AC method or Vietta, etc:
   Groups:
   (a) $x^2 + 2x - 63$
   (b) $2a^3 - 28a^2 + 80a$
   (c) $50y^3 + 160x^2y + 128xy^2$
   Individually:
   (d) $x^2 + 5x - 66$
   (e) $a^2 - 18a + 81$
   (f) $k^2 + 8k + 16$
   (g) $5p^4 - 40p^3 + 35p^2$
   (h) $25k + 6k^2 + 14$
   (i) $8 + 15n^2 + 26n$
   (j) $7a^3b - 40a^2b^2 - 12ab^3$
   (k) $48x^3 - 72x^2y + 27xy^2$
   (l) $9z^4 + 49w^8 + 42z^2w^4$
5. Factor by using the quadratic formula.
   Groups:
   (a) $x^2 - 3x - 7$
   (b) $121y^2 + 4$
   (c) $(5x + 7)(2x - 3) + 2x(x + 15) + 35$
   (d) $5x - 2 - 6x^2$
   (e) $\frac{1}{2}x^2 - \frac{2}{7} - \frac{5}{14}x$
   Individually:
   (f) $k(k + 10) + 34$
   (g) $4z + z^2 + 6$
   (h) $-3 - 5x^2 + 7x$
   (i) $-5x - 9 + x^2$
   (j) $y^2 + 8y + 19$
   (k) $9a^2 + 49$
   (l) $(6x + 5)(x - 3) + 2x(7x + 5) - x + 12$

(m) $x(x-6)+10$

(n) $\frac{1}{3}x^2 - \frac{7}{6} - \frac{3}{2}x$

6. Factor the following binomials.

Groups:

(a) $9x^2 - 64$

(b) $27a^3 + 8b^3$

(c) $81k^6 - 24m^9$

Individually:

(f) $49 - 16p^2$

(g) $200w^4 - 18z^6$

(h) $81a^4 - 1$

(i) $8a^6 - 125b^9$

(j) $1000x^{12} + 64y^6$

7. Apply all possible strategies learned and factor them completely.

Groups:

(a) $30y^4 + 70y^3 - 120y^2 - 280y$

(b) $p^2 - q^2 + 10q - 25$

(c) $(x^2-2) - 3(x^2-2) - 28$

(d) $h^6 - 7h^3 - 8$

Individually:

(f) $k^6 + 26k^3 - 27$

(g) $p^7 + 27p^4 - p^3 - 27$

(h) $24m^7 + 21m^4 - 3m$

(i) $4x^4 - 10x^3 - 36x^2 + 90x$

(j) $a^2 - b^2 + 8b - 16$

(k) $60p^4q + 78p^3q - 180p^2q$

(l) $(x^2+2)^2 + 5(x^2+2) - 24$

(m) $(x^3+12)^2 - 16$

(n) $(a^3+34)^2 - 49$

(o) $(p+q)^3 + k^3$

(p) $4m^2 + 36m(7n-1) + 81(7n-1)^2$

(q) $x^2 - y^2 - x - y$

(r) $x^2 + xy - 2y^2 - y + x$

x

Algebra Lab Module 4

Chapter 3: Polynomial Equations

1. Solve the following quadratic equations by factoring.
   Groups:

   (a) $x^2 + 5x = 24$

   (b) $8y(y + 3) = 2y - 5$

   (c) $40a^2 - 90 = 0$

   (d) $3x^2 = 12x$

   Individually:

   (e) $z^2 - 18 = -7z$

   (f) $6x(x + 4) = x - 15$

   (g) $32y^2 - 162 = 0$

   (h) $x^2 = 25x$

2. Solve by using the square root property: $x^2 - u = 0 \iff x^2 = u \iff x = \pm\sqrt{u}$
   Groups:

   (a) $x^2 = 81$

   (b) $5k^2 = 35$

   (c) $4y^2 + 64 = 0$

   (d) $(x + \sqrt{3})^2 = 32$

   (e) $\left(x - \frac{1}{4}\right)^2 = -49/27$

   Individually:

   (f) $x^2 = 169$

   (g) $6v^2 - 30 = 0$

   (h) $8y^2 + 32 = 0$

   (i) $(k + 9)^2 = 24$

   (j) $(x - 9)^2 = 121$

   (k) $(z + \sqrt{2})^2 = 28$

   (l) $\left(x - \frac{1}{5}\right)^2 = -\frac{19}{8}$

3. Solve the quadratic equation by completing the square and then applying the square root property.

   Groups:

   (a) $x^2 - 4 + 22x = 0$
   (b) $z^2 - 8z = -24$
   (c) $4y^2 + 24y = -160$
   (d) $2k(k-3) = 4 + k^2$

   Individually:

   (e) $y^2 + 14y - 3 = 0$
   (f) $x^2 - 24x + 156 = 0$
   (g) $2x^2 + 20x = -70$
   (h) $5y(y-2) = 6 + 3y$
   (i) $-4k^2 - 12k + 5 = 0$
   (j) $-2y^2 - 14x + 5 = 0$

4. Solve by using the quadratic formula.

   Groups:

   (a) $x^2 - 3x - 7 = 0$
   (b) $121y^2 + 4 = 0$
   (c) $(5x+7)(2x-3) = -2x(x+15) - 35$
   (d) $5x - 2 = 6x^2$
   (e) $\frac{1}{2}x^2 - \frac{2}{7} = \frac{5}{14}x$

   Individually:

   (f) $k(k+10) + 34 = 0$
   (g) $4z + z^2 = -6$
   (h) $-3 - 5x^2 = -7x$
   (i) $-5x = 9 - x^2$
   (j) $y^2 + 8y + 19 = 0$
   (k) $9a^2 + 49 = 0$
   (l) $(6x+5)(x-3) = -2x(7x+5) + x - 12$
   (m) $x(x-6) = -10$
   (n) $\frac{1}{3}x^2 - \frac{7}{6} - \frac{3}{2}x = 0$

5. Solve the quadratic equations by using any method.

   Groups:

   (a) $(3y-5)^2=0$
   (b) $x^2+4x=-2$
   (c) $\dfrac{x^2-4x}{6}-\dfrac{5x}{3}=0$
   (d) $2(x+4)+x^2=x(x+2)+8$
   (e) $x^2-\sqrt{121}=0$

   Individually:

   (f) $(2x+1)^2=0$
   (g) $a^2+8a=-3$
   (h) $\dfrac{x^2+2x}{7}-\dfrac{x}{14}=\dfrac{3}{2}$
   (i) $3(z-5)+z^2=z(z+3)-15$
   (j) $\dfrac{3}{5}x^2-\dfrac{1}{10}x=\dfrac{1}{2}$
   (k) $\dfrac{1}{12}x^2-\dfrac{11}{24}x=-\dfrac{1}{2}$
   (l) $y^2-5y=5y(y-1)-4y^2+1$
   (m) $k^2-4k=4k(k-1)-3k^2+2$
   (n) $(3x-8)(x+2)=3x^2+10$
   (o) $(2a+7)(a+1)=2a^2-11$
   (p) $x^2-\sqrt{5}=0$