ALGEBRA REVIEW

Math 120R

Special Products of factorizations

- $(x+y)^2 = x^2 + 2xy + y^2$
- $(x-y)^2 = x^2 - 2xy + y^2$
- $(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$
- $(x-y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$
- $(x+y)(x-y) = x^2 - y^2$
- $(x+y)(x^2 - xy + y^2) = x^3 + y^3$
- $(x-y)(x^2 + xy + y^2) = x^3 - y^3$

Quadratic Formula

The solutions to $ax^2 + bx + c = 0$ are: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Properties of exponents and radicals

- $a^m a^n = a^{m+n}$ $\qquad \dfrac{a^m}{a^n} = a^{m-n}$
- $(ab)^n = a^n b^n$ $\qquad \left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$
- $(a^m)^n = a^{mn}$
- $a^{-n} = \dfrac{1}{a^n}$
- $\sqrt[n]{a} = a^{\frac{1}{n}}$ $\qquad \sqrt[n]{a^m} = a^{\frac{m}{n}} = (\sqrt[n]{a})^m$
- $\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$ $\qquad \sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$
- $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

1. (a) Solve the equation $13t + 2 = 47$
   (b) Solve the equation $3t - \dfrac{2(t-1)}{3} = 4$
   (c) Solve $6c - 7 = 2(c+4)$ for c
   (d) Solve $A = \dfrac{1}{2}(a+b)h$ for h
   (e) Solve $y'y^2 + 2xyy' = 4y$ for y'

(f) Solve $S = \dfrac{2r - a}{r - 1}$ for r

2. Expand and simplify

   (a) $2(3x - 7)$
   (b) $-10r(5r - 6rs)$
   (c) $x(3x - 8) + 2(3x - 8)$
   (d) $(x - 2)(4x + 6)$
   (e) $p(p - 3q)^2$
   (f) $-(\sqrt{2x} + 1)^2$

3. Factor completely (if possible)

   (a) $3u^4 - 9u^3$
   (b) $12x^3y^2 - 18x$
   (c) $x^2 - 3x + 2$
   (d) $x^3 + 2x^2 - 3x$
   (e) $r(r - s) - 2(s - r)$
   (f) $8gs - 12hs + 10gm - 15hm$
   (g) $t^4 - 18t^2 + 81$
   (h) $16 - x^4$

4. Solve the equations

   (a) $x^2 + 7x + 6 = 0$
   (b) $\dfrac{3}{2x} + 2x = 8$
   (c) $\sqrt{5y - 1} = 13$
   (d) $r^3 - 6r^2 = 5r - 30$
   (e) $3\sqrt{x} = \dfrac{1}{2}x$
   (f) $\dfrac{(3x - 4)(x - 2)}{(x - 5)(x - 1)} = 0$

5. Use the rules of exponents to simplify the following:

   (a) $(-5)^2$
   (b) $(-1)^{13}$
   (c) 8^0
   (d) $16^{\frac{1}{2}}$
   (e) $\sqrt{16}$

(f) $16^{\frac{1}{4}}$

(g) 25^{-2}

(h) $25^{-\frac{1}{2}}$

(i) $(\frac{1}{27})^{-\frac{1}{3}}$

(j) $\sqrt{(-4)^2}$

(k) $-64^{\frac{3}{2}}$

(l) $(-64)^{\frac{3}{2}}$

(m) $z^3(3z)^4$

(n) $\dfrac{25p^8}{10p^4q}$

(o) $\dfrac{y^4(x^3y^{-2})^2}{2x}$

(p) $\dfrac{a^{n+1}3^{n+1}}{a^n3^n}$

(q) $\left(\dfrac{35(2b+1)^9}{7(2b+1)^{-1}}\right)^2$

6. True or False?

(a) $t^3t^4 = t^{12}$

(b) $x^2y^5 = (xy)^{10}$

(c) $(p^3)^8 = p^{11}$

(d) $5u^2 + 5u^3 = 10u^5$

(e) $(3r)^2 9s^2 = 81r^2s^2$

(f) $\dfrac{m^8}{2m^2} = \dfrac{1}{2}m^4$

(g) $5z^{-4} = \dfrac{1}{5z^4}$

(h) $-4w^2 - 3w^3 = -w^2(4 + 3w)$

(i) $(u + v)^{-1} = \dfrac{1}{u} + \dfrac{1}{v}$

(j) $2^{-1} = -2$

(k) $\dfrac{1}{a+b} = a^{-1} + b^{-1}$

(l) $\dfrac{c^{\frac{3}{2}}}{d^{\frac{1}{2}}} = \sqrt{\dfrac{c^3}{d}}$

(m) $(-2y)^3 = -2y^3$

(n) $\dfrac{z^m}{z^n} = z^{m-n}$

(o) $(-3y)^2 = -9y^2$

(p) $\dfrac{1}{3x} = 3x^{-1}$

(q) $\dfrac{7}{(a^2-b)^{-\frac{1}{2}}} = \dfrac{7}{\sqrt{a^2-b}}$

(r) $x^{\frac{1}{3}} = \dfrac{1}{x^3}$

(s) $\sqrt[3]{t^4} = t^{\frac{3}{4}}$